



Safety-Kleen Corp.

RCRA Facility Investigation Phase I Release Assessment Wor

Safety-Kleen Corp. Recycle Center Dolton, Illinois ILD980613913

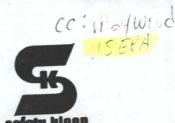


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March 4, 1994



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Mr. Lawrence W. Eastep, P.E.

Manager, Permit Section
Illinois Environmental Protection Agency
Division of Land Pollution Control
2200 Churchill Road
Springfield, IL 62794-9276

MAY 0 4 1994

Re: RCRA Facility Investigation Phase I Workplan, Dolton Recycle Center (ILD980613913)

Dear Mr. Eastep:

Transmitted with this letter are three copies of the document entitled "RCRA Facility Investigation, Phase I Release Assessment Workplan, Safety-Kleen Corp. Recycle Center, Dolton, Illinois (ILD980613913)." The Workplan contains the procedures to determine if solid waste management units (SWMUs) have released, are currently releasing, or have the potential to release hazardous waste and/or hazardous waste constituents to soil and/or air.

In addition to the soil and air investigations, Safety-Kleen Corp. has voluntarily included in the Phase I Workplan a ground-water evaluation to identify and characterize ground-water quality and to further evaluate ground-water flow directions in the shallow perched zone. This work is not required by the Part B Permit until Phase III of the RCRA Facility Investigation (RFI). However, this voluntary information on ground-water conditions will be valuable in the design of potential future RFI activities. Safety-Kleen Corp. has voluntarily conducted ground-water activities during Corp. has voluntarily conducted ground-water activities during Center. Safety-Kleen believes the results of these voluntary activities benefit human health and the environment by accelerating the overall RFI process.

We appreciate the Agency's cooperation in developing this Workplan. If you have questions concerning this Workplan, please contact me at (708) 468-2216.

Sincerely, SAFETY-KLEEN CORP.

Scott Davies P.G.

Sr. Project Manager - Remediation

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Enclosures

cc: Desi Chari John Valerius Gary Long

PROJECT: 815

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RCRA FACILITY INVESTIGATION
PHASE I RELEASE ASSESSMENT WORKPLAN
SAFETY-KLEEN CORP.
DOLTON RECYCLE CENTER
DOLTON, ILLINOIS
ILD980613913

March 3, 1994

Submitted by:

Safety-Kleen Corp. 1000 N. Randall Road Elgin, IL 60123



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PROJECT: 815

PART I

GENERAL FACILITY INFORMATION

RCRA FACILITY INVESTIGATION
PHASE I RELEASE ASSESSMENT WORKPLAN
SAFETY-KLEEN CORP.
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CHAPTER I-1

INTRODUCTION

Safety-Kleen Corp. (S-K) owns and operates a recycling facility (SIC 2851) in Dolton, Illinois. The Dolton Recycle Center is permitted to store and treat RCRA hazardous wastes (ILD980613913). As a condition of the RCRA permit, the Illinois Environmental Protection Agency (IEPA) requires S-K to conduct a RCRA Facility Investigation (RFI). The purpose of the RFI is to determine the nature and extent of releases of hazardous wastes and hazardous constituents from certain solid waste management units (SWMUs) at the facility.

In accordance with the RCRA permit, the RFI is divided into three phases. This RFI Phase I Workplan describes the procedures that will be undertaken to determine if the subject SWMUs have released hazardous wastes and/or hazardous constituents to the soil or air. The workplan has been organized per Attachment F of the RCRA permit, entitled "Scope of Work for a RCRA Facility Investigation."

MAR - 7 1994

Present Facility Operations

PERMIT SECTION

S-K has owned and operated the facility since March 1987. The Dolton Recycle Center occupies a 30-acre site in an industrialized area about 20 miles south of downtown Chicago, Illinois (Figure I-1-1). The address of the facility is:

Safety-Kleen Corp. 633 East 138th Street Dolton, IL 60419

The Dolton Recycle Center is a reclamation and recycling facility that accepts organic chemicals and solvent wastes from S-K service centers and other S-K recycle centers, and from industrial and commercial facilities. Spent materials brought to the facility are regenerated into product or blended for use as a fuel in cement kilns. A list of RCRA wastes which can potentially be managed at the Dolton Recycle Center is presented in Appendix I-A. Principal wastes managed at the facility are paint waste, lacquer thinner, mineral spirits, and waste oil.

The facility has received commendations from local officials for its emergency response planning (Appendix I-B). The facility is secured by various measures which include a perimeter fence, building enclosures, and limited access to

FIGURE 1-1-1 :VICINITY MAP, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (ILD980613913)

SCALE

controls. All process equipment is inside, and the facility is manned 24 hours per day. Warning signs are posted at various locations so as to be visible from any approach and to provide adequate warning.

The site is equipped with an onsite communication system and telephones for access to offsite. Alarm systems for certain equipment, areas, and storage tanks are maintained. Emergency numbers are posted for quick response to an emergency.

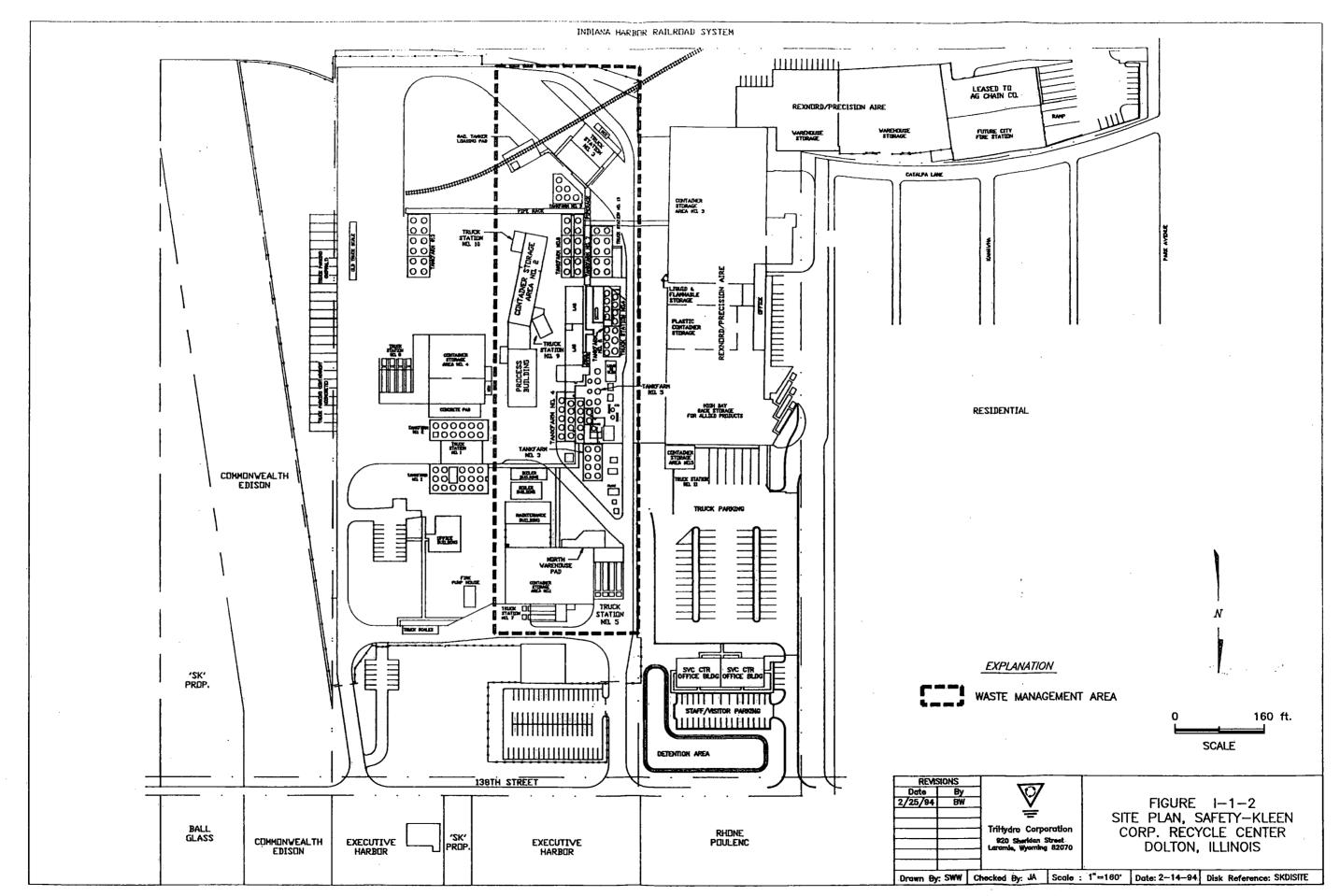
Fire and spill response and other safety equipment is located across the site. The facility is equipped with a foam and water fire suppressant system. Portable fire extinguishers are placed, marked, and maintained at key locations. Spill and first aid stations on the site provide centralized access to tools, supplies, and equipment for efficient emergency response. Emergency showers and eye wash stations are located in various process buildings and storage areas.

Reclamation Activities

A site plan of the Dolton Recycle Center is shown on Figure I-1-2. All waste receipt, storage, processing, and shipping occurs in the western half of the facility, as shown on Figure I-1-2. The eastern half of the facility is used for product storage and shipping. The warehouse to the west of the waste management area is a distribution center used to store dry commercial products for shipment to S-K service centers.

Containerized wastes are unloaded at Truck Station No. 5, and stored in Container Storage Area No. 1, where they are tested by the facility laboratory to determine proper handling. After testing, containerized wastes are handled in the following manner:

- 1. All chlorinated containerized wastes are shipped from Container Storage Area No. 1 (loaded at Truck Station No. 5) to the Safety-Kleen recycle center in Hebron, Ohio. Bulk chlorinated wastes are shipped from Tank Farm No. 4 (loaded at Truck Station No. 4) to the S-K Hebron Recycle Center.
- 2. Liquid paint solvent and lacquer thinner containerized wastes are transferred to day tanks at the
 North Warehouse Pad (former Truck Station No. 6),
 and then pumped to Tank Farm No. 4 for temporary
 storage prior to processing in the Tank Farm No. 5
 Process Area.



3. Semi-solid containerized wastes are trucked from Truck Station No. 5 to Truck Stations No. 9 and No. 10 for temporary storage in Container Storage Area No. 2 prior to processing (liquefying) in the Process Building. Liquified wastes are pumped to Tank Farm No. 6, where they are blended to fuel specifications. Fuels are pumped to Truck Station No. 3, and then transported offsite to kiln locations.

Bulk wastes are received at Truck Station No. 3 and at the railcar facility located east of the truck station. Most of the bulk wastes are spent mineral spirits used in parts washing. Spent mineral spirits are pumped to Tank Farms No. 7 and No. 8 before being pumped to the West Tank Farm Process Area. Other bulk waste fuels are pumped to Tank Farm No. 6, or to Tank Farm No. 9 and then Tank Farm No. 6, for fuel blending.

Process units in Tank Farm No. 5 neutralize, distill, fractionate, and dry the paint solvent wastes, lacquer thinner wastes, and spent mineral spirits in order to reclaim the products. The tanks in Tank Farm No. 5 contain in-process (distilled) products which are no longer RCRA hazardous wastes. Reclaimed products are stored in Tank Farms No. 1, No. 2, No. 3, and No. 13 prior to offsite shipment.

Waste Management

Residuals from the process units include wastewater and still bottoms. Wastewater that comes into the facility with the petroleum wastes is drained from tanks into tanker trucks at Truck Stations No. 3 and No. 4 and then shipped offsite for treatment at the S-K BresLube used oil re-refinery in East Chicago, Indiana. Wastewater generated during distillation and other processes in Tank Farm No. 5 is pumped to the railcar facility, and then shipped offsite for treatment at the DuPont facility in Deepwater, New Jersey. The remaining wastewater streams (showers, toilets, stormwater runoff, boiler and cooling tower blowdown) are discharged to the sanitary sewer of the Metropolitan Water Reclamation District of Greater Chicago.

Still bottoms typically have a high BTU content and are processed through the fuels program described above. Solid wastes which have low BTU content or cannot be processed into fuel are containerized and shipped offsite from Truck Station No. 10 for incineration. There is no onsite disposal of wastes at the facility.

Stormwater Management

Stormwater from the recycle center is managed in two ways. Stormwater runoff on the Precision Aire property is routed to the stormwater detention pond located in the north-western corner of the facility (Figure I-1-2), and then discharged to the municipal sanitary sewer system. Stormwater runoff from the other areas of the recycle center is discharged directly to the sanitary sewer, as described above.

Previous Facility Operations

Three types of activities occurred previously on the site:

- Barker Chemical/McKesson Envirosystems. The site occupied by the current storage and processing operations has been used since 1951 principally to reclaim paint solvent and lacquer thinner wastes.
- <u>Rexnord/Precision Aire</u>. Most of the western warehouse was leased for manufacture of metal components.
- <u>TriStamp/Agri-Chain</u>. The southwestern corner was and continues to be leased for a punch press operation.

Each of these previous operations is described in more detail below.

Barker Chemical/McKesson Envirosystems

A description of these previous operations was obtained from the RCRA Facility Assessment (RFA) prepared by IEPA in 1991. As shown in site records, the site was farmland in 1949. According to the RFA, the facility has been in continuous operation since 1951.

In 1951, Barker Chemical Company constructed a plant to manufacture coatings for wood and metal, plant adhesives, surface primers, putty, and thinners for different types of coatings. The operations also included the recycling of an estimated 150,000 gallons per month of spent solvents, which were mainly paint solvents and lacquer thinner from the paint industry.

Ownership of the site passed to Foremost-McKesson, Inc. in April 1981, and the facility became known as McKesson

Envirosystems. There is no indication in the RFA that operations changed with the change of ownership. McKesson operated the facility until purchase by S-K in March 1987.

Rexnord/Precision Aire

Rexnord manufactured metal components in the large warehouse building located west of the former Barker Chemical property from the 1940s to 1985. According to former facility personnel, Rexnord manufactured primarily automobile universal-joints and chain assemblies. The former processes included metal machining, heat treating, and quenching.

Rexnord sold the property to Precision Aire and the Village of Dolton in 1985. Precision Aire used the facility to manufacture air filters. The Village of Dolton leased the portions of the warehouse building to small local businesses and utilized other areas for equipment storage. Known lease holders during this era included a window manufacturer and roofing contractor company.

S-K purchased the property from the Village of Dolton and Precision Aire in 1990. S-K utilizes the eastern portion of this building as a dry product distribution center. The western potion of the warehouse building consists of vacant areas and equipment storage areas. The most southwestern portion of the warehouse building is leased to TriStamp/Agri-Chain.

TriStamp/Agri-Chain

TriStamp/Agri-Chain leases the southwestern-most portion of the large warehouse building (former Rexnord facility) from S-K. TriStamp/Agri-Chain commenced operations at this site in approximately 1987. TriStamp/Agri-Chain machines metal parts and components under contract to automobile manufacturers and hardware companies. The primary operations consist of metal stamping, grinding, and machining. Equipment in operation at this facility include a metal stamp press, drill press, grinders, and a vibratory machine.

According to the operations manager, a small quantity of waste oil (less than 2 gallons per year) is the only waste generated at this facility. The waste oil is generated during maintenance (routine equipment oil changes) of the onsite equipment and disposed of through a local waste oil recycler. Other small quantities of liquids and lubricants used at the facility are consumed during the machining processes.

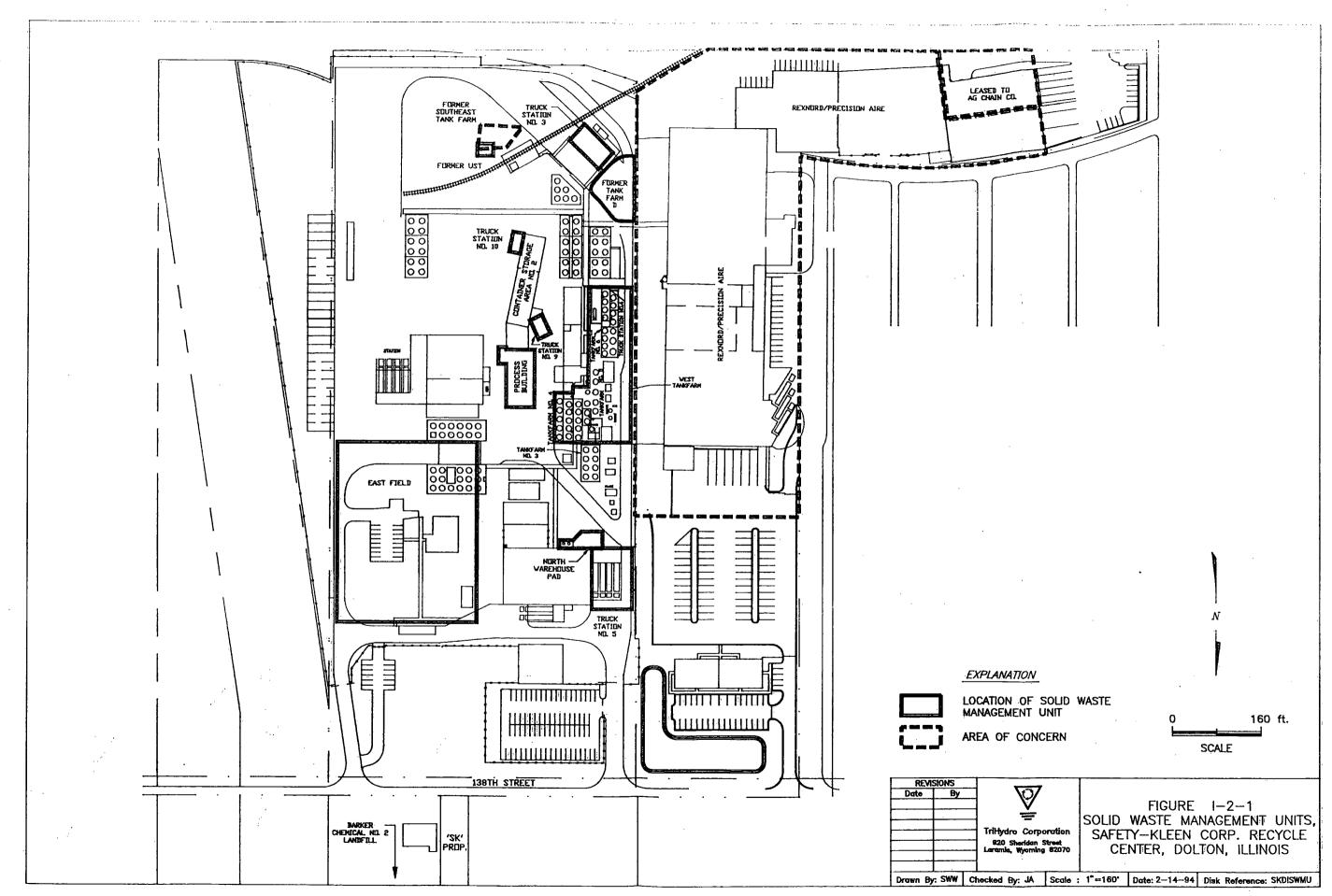
CHAPTER I-2

SOLID WASTE MANAGEMENT UNITS

The locations of solid waste management units (SWMUs) and areas of concern (AOCs) covered by the RFI are shown on Figure I-2-1. Several of the SWMUs have been combined into Corrective Action Management Units (CAMUs) because of their proximity and similarity of wastes managed. SWMUs, CAMUs, and AOCs addressed in this Workplan are:

- Barker Chemical No. 2 Area
- East Field
- Truck Station No. 3
- Truck Station No. 5
- North Warehouse Pad (Former Truck Station No. 6)
- Truck Station No. 9
- Truck Station No. 10
- Process Area in the South Warehouse (including Drum Emptying Unit Vat 1, Automated Drum Handling Unit Vat 2, Ballmill and Ballmill Sump)
- West Tank Farm [including Driveway to the Facility, Tank Farm No. 4, Tank Farm No. 5 (in-process storage tanks, Solvent Dryers #1 through #4, Pot Stills #1 and #2, Distillation Column, Thin Film Evaporator and Vapor Recovery Systems), Tank Farm No. 6, and Truck Station No. 4]
- Former Tank Farm D
- Former Southeast Tank Farm
- Rexnord/Precision Aire
- TriStamp/Agri-Chain

After discussions between S-K and IEPA, the other SWMUs listed in the Part B Permit (Container Storage Areas 1 and 2) were considered to be covered by other sections of the permit, and thus are not included in this Workplan (Illinois Environmental Protection Agency, 1994). Current conditions at the SWMUs listed above are shown in the photodocumentation in Appendix I-C.



Barker Chemical No. 2 Area

The area is reported by the Illinois Environmental Protection Agency (IEPA) to be located north of 138th Street, as shown on Figure I-2-1. S-K personnel at the site during the Barker Chemical and McKesson periods of operation are not aware of any waste disposal activities by either party on the S-K property north of 138th Street. Disturbed ground, which is shown on a 1980 aerial photograph on Figure I-2-2, may indicate construction activities on the property north of 138th Street. Regulatory reports indicate Barker Chemical Company may have disposed of empty drums returned from industrial accounts north of 138th Street on property not owned by S-K (Illinois Environmental Protection Agency, 1991).

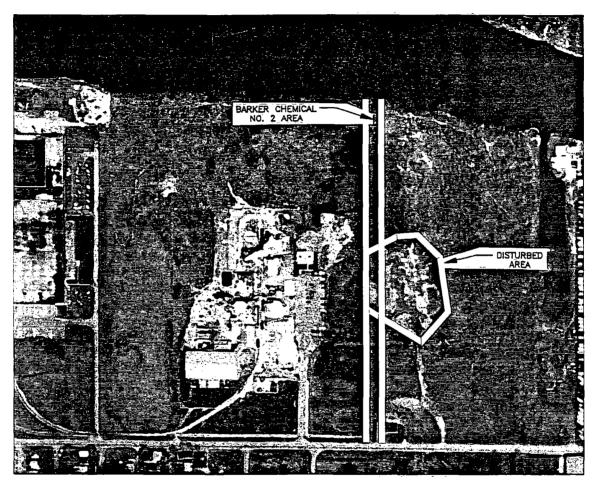
The extent of the disturbed ground is shown on an April 1980 aerial photo, which is reproduced on Figure I-2-2. Essentially all of the disturbed area is located east of the S-K property north of 138th Street. S-K intends to investigate the small area of possible disturbance on S-K property (approximately 0.13 acre), which is shown on Figure I-2-2, to determine if any part of the potential SWMU was on S-K property, and thus subject to the RCRA corrective action process.

East Field

The area is located in the northeastern corner of the facility, as shown on Figure I-2-1. Barker Chemical Company used the area to dispose of empty drums. As reported in the RFA (Illinois Environmental Protection Agency, 1991), approximately 400 drums and soil were excavated from the area in December 1979 and January 1980. It is believed that McKesson required Barker to perform this remediation prior to purchase of the property. An additional 12 drums were uncovered and disposed of in 1991 while digging a trench for a sewer line in an open area east of Container Storage Area No. 1.

Truck Station No. 3

The truck station was constructed by S-K in 1990 in the southwestern corner of the facility (Figure I-2-1). Prior to that time, the area was open, undisturbed ground. S-K uses the truck station to receive bulk wastes (principally mineral spirits), and to ship out bulk reclaimed mineral spirits and fuels.



1980

FIGURE 1-2-2 :LOCATION MAP, BARKER CHEMICAL NO. 2
AREA (April 1980 Aerial Photo)

The station is a covered, reinforced concrete structure equipped with secondary containment to contain spills. A spill of approximately 250 gallons of waste oil occurred at the station in 1991. The spill was entirely contained on concrete and immediately cleaned up. There was no evidence of any releases during a TriHydro inspection on February 16, 1994.

Truck Station No. 5

The truck station is located in the northwestern corner of the facility northwest of Container Storage Area #1 (Figure I-2-1). It has been in use since at least 1987. S-K uses the truck station for the unloading of all containerized wastes from truck trailers, and the loading of containerized wastes that are to be treated at other facilities.

The area was gravel until 1989. Currently, the station consists of a covered, reinforced concrete structure 55 feet wide by 90 feet long, including the dock area, with capacity for four truck trailers. There is a concrete-lined trench on the south side to collect stormwater and prevent it from entering the truck station. The pad is sloped toward the dock area to contain and collect potential spills. There is no information of any uncontained releases at the truck station (Appendix I-D), and no evidence of any releases during a TriHydro inspection on February 16, 1994.

North Warehouse Pad (Former Truck Station No. 6)

The north warehouse pad is located in the northwestern corner of the facility south of Container Storage Area #1 (Figure I-2-1). It has been in use since at least 1987.

S-K used the truck station for the internal transfer of containerized waste from Container Storage Area No. 1 to Container Storage Area No. 2. The station was a covered, sloped, reinforced concrete structure 28 feet wide by 53 feet long with capacity for a single transfer truck. The use was converted to a staging area for unloading liquid containerized wastes into two 3,000-gallon day tanks, where samples are collected for laboratory analysis before they are pumped to Tank Farm No.4 or No. 6. The two 3,000-gallon day tanks are located on a reinforced concrete pad within an 18-inch high concrete dike wall. A 2-inch curb is located around the perimeter of the concrete pad, and the floor slopes toward a sump located in the east corner of the truck station. There

is no information of any uncontained spills at the former truck station or pad (Appendix I-D), and no evidence of any releases during a TriHydro inspection on February 16, 1994.

Truck Station No. 9

The truck station is located on the west side of container Storage Area No. 2 (Figure I-2-1). It has been in use since at least 1987. S-K uses the truck station for the internal transfer of containerized wastes to and from the container storage area.

The station is a sloped, reinforced concrete pad 23 feet wide by 50 feet long with the capacity for two truck trailers. The station is equipped with curbs for secondary containment. There is no information of any uncontained spills at the truck station (Appendix I-D), and no evidence of any releases during a TriHydro inspection on February 16, 1994.

Truck Station No. 10

The truck station is located on the east side of Container Storage Area No. 2 (Figure I-2-1). It was constructed and has been in use since 1991 for the internal transfer of containerized wastes to and from the container storage area. The area was used for a loading dock previously.

The station is a sloped, reinforced concrete pad 36 feet wide by 20 feet long with the capacity for four truck trailers. The station is equipped with sloped concrete side walls/curbs for secondary containment. There is no information of any uncontained spills at the truck station (Appendix I-D), and no evidence of any releases during a TriHydro inspection on February 16, 1994.

Process Area in South Warehouse

The process area occupies the northern third of the South Warehouse (Figure I-2-1). The indoor area has been used since at least 1983 to liquify containerized semi-solid wastes prior to fuel blending in the West Tank Farm. The units contained in the process area include:

- <u>Drum Emptying Unit Vat #1</u>. A 600-gallon carbon steel mixing bin used for manually dumping pourable wastes entering the fuels program. Liquids with grindable solids are transferred to the ballmill, and the resulting liquids are pumped to Tank Farm #6. Nongrindable solids are containerized, and shipped offsite from Truck Station No. 9 or No. 10 for incineration.
- <u>Automated Drum Handling Unit Vat #2</u>. A 1,600-gallon carbon and stainless steel mixing bin used for automatically dumping pourable wastes. Wastes are processed for the fuels program in the same manner as at Vat #1. Nongrindable solids are containerized, and shipped offsite from Truck Station No. 9 or No. 10 for incineration.
- <u>Ballmill</u>. High solids content wastes are recirculated through a ball grinder barrel constructed of stainless and carbon steel. Grindable solids are transferred to Tank Farm No. 6 (fuels program).
- <u>Ballmill Sump</u>. A 40-gallon stainless steel-lined sump with metal grating to collect spills in the ballmill.

The process area is sloped away from doors to contain spills, and the floor and lower walls are covered with epoxy to minimize the potential for a release.

IEPA requested an inspection by an independent registered professional engineer to assess the integrity of the concrete floor and secondary containment structures to prevent releases to underlying soils. The engineer's report is presented in Appendix I-E. S-K maintains a policy of inspecting and sealing cracks or repairing deteriorated areas of the epoxy/polymer-coated floor, berms, and lower walls on a routine basis. The engineer determined that the floor and secondary containment structures were intact, and that no corrective actions were necessary.

West Tank Farm

The West Tank Farm (Figure I-2-1) includes waste transportation, transfer, process, and storage facilities in the west-central part of the facility. The tank farm has been in place at least since 1961, based on site records. The West Tank Farm contains the following units:

- <u>Driveway to the Facility</u>. A concrete road that runs along the western edge of the facility. The driveway is used to truck bulk wastes to Truck Station No. 3, and to transfer bulk fuels at Truck Station No. 4.
- Truck Station No. 4. An uncovered, sloped, reinforced concrete pad 12 feet wide by 103 feet long with capacity for a single tanker trailer. The truck station is used for transfer of bulk fuels to Tank Farm No. 6.
- Tank Farm No. 4. Fifteen aboveground 15,000-gallon carbon steel tanks permitted for the storage of hazardous waste. The tanks contain wastes to be blended into the fuels program in Tank Farm No. 6. The tank farm floor is reinforced concrete with perimeter and internal reinforced concrete coated dikes to control spillage, leakage, and stormwater. Both floors and dikes are coated with epoxy. There are two secondary containment systems with capacities in excess of 100% the volume of the largest tank.
- Tank Farm No. 5. A process area which contains seven carbon steel and two stainless steel tanks, and several process units to reclaim mineral spirits, paint wastes, and lacquer thinner. Two former RCRA tanks (55 and 56) were clean closed, and all tanks are now used for storage of in-process (distilled) products. The floor and dikes are constructed in the same way as those in Tank Farm No. 4. The secondary containment system has a capacity more than twice the volume of the largest tank (15,000 gallons).
- Process Units. Tank Farm No. 5 contains process units, including a thin film evaporator to reclaim solvents, solvent dryers #1 through #4, a distillation column, and pot stills #1 and #2 to adjust the color of the reclaimed products. All process units are located within the Tank Farm No. 5 secondary containment system.
- Tank Farm No. 6 (Former J Tank Farm). Fifteen above-ground carbon steel tanks permitted for the storage of hazardous wastes. All tanks have a capacity of 15,000 gallons, except for two 20,000 gallon tanks and one 17,500 gallon tank. The tanks are used to blend various streams into fuels. The tank farm floor is epoxy-coated reinforced concrete with perimeter and internal epoxy-coated dikes to control spillage, leakage, and stormwater. There

are two secondary containment systems with capacities in excess of 100% of the volume of the largest tank.

A fire and several spills have occurred in the West Tank Farm (Appendix I-D). The number and size of the spills have decreased over time, because all process and waste transfer lines have been brought above-ground and because S-K has implemented a rigorous inspection and maintenance program. The largest release occurred during a fire in April 1986 prior to S-K purchase of the facility, when approximately 30,000 gallons of isopropyl alcohol, toluene, vinyl acetate, and methyl isobutyl ketone were lost by combustion.

Former Tank Farm D

The former tank farm was located in the southwestern corner of the facility (Figure I-2-1). It was in operation to 1987 for the storage of reclaimed product. S-K decommissioned the tank farm shortly after purchase of the facility. The site is currently a vacant area and roadway to Truck Station No. 3. The former tank farm had an earthen floor and earthen dike secondary containment. Several small spills occurred at the former tank farm (Appendix I-D); however, there was no evidence of releases during a TriHydro inspection on February 16, 1994.

Former Southeast Tank Farm

While reviewing plant records during preparation of this Workplan, S-K discovered a former above-ground tank farm in the southeastern part of the plant (Figure I-2-2). S-K has voluntarily added this tank farm as an area of concern to be addressed during Phase I.

Barker Chemical Company installed the tank farm prior to 1961. It contained 15 above-ground storage tanks. The above-ground tank farm was used until 1984, when McKesson replaced it with 22 underground storage tanks (USTs) in the same area. McKesson used the above-ground tanks and USTs for the storage of product. S-K removed the USTs in 1987 shortly after acquiring the facility. One underground structure (possible former UST area) remains in place (Figure I-2-2). The location and dimensions of the former UST area were confirmed during a field survey on February 16, 1994.

Rexnord/Precision Aire Property

Rexnord operated on a punch press operation in a large building located west of the Barker Chemical property (Figure I-2-1). More recently, Precision Aire manufactured air filters, and the Village of Dolton leased portions of the large warehouse building to small businesses. S-K purchased the property in 1990. During a due diligence investigation in 1990 prior to purchase of the property, S-K discovered three current or former areas of concern:

- Two former underground fuel oil storage tanks (USTs) located off the southeastern corner of the building;
- A former underground fuel oil storage tank located off the southern side of the building; and
- Two former aboveground storage tanks located off the southern side of the building.

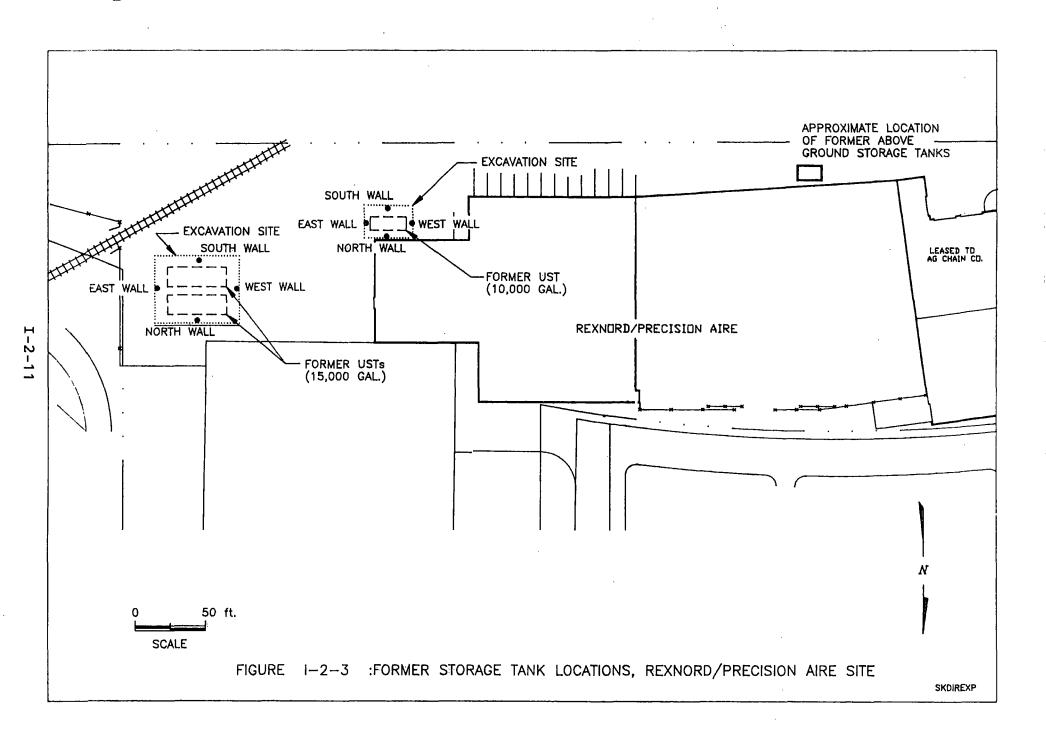
Locations of these SWMUs are shown on Figure I-2-3.

The two USTs were used to store fuel oil for the boilers. The two USTs were removed in 1991 along with all impacted soils. Soil samples were collected and analyzed, and the excavations determined to be clean. The results of the UST tank removals and soil testing are included in Appendix II-D.

According to the due diligence report, the above-ground tanks were used to store fuel oil. Communication with site personnel indicates that one of the aboveground tanks may have been used to store an acid solution. Site records indicate the aboveground tanks may have been present between 1961 and 1987.

TriStamp/Agri-Chain

TriStamp/Agri-Chain operated and continues to operate a metal machine shop in the southwestern corner of the building located west of the Barker Chemical facility (Figure I-2-1). S-K conducted a due diligence investigation in 1990 prior to purchase of the property. During the investigation, no SWMUs or releases were identified on or near the property.



CHAPTER I-3

REGIONAL SETTING

The Dolton Recycle Center is located in the Village of Dolton approximately 20 miles south of downtown Chicago. The site occupies 30 acres in an area zoned M-5 (Industrial), which is the heaviest classification of industrial zoning in Cook County. The site and surrounding area have historically been devoted to light to heavy industrial users.

Topographic Setting

A topographic map of the vicinity is presented on Plate I-1. The area is flat except for the built-up Land and Lakes landfill, located approximately 2,000 feet east, and an excavation located approximately 500 feet north of the Dolton Recycle Center. The excavation has been mined for clay and for eventual use as a marina.

The site slopes very gently from south to north, and has about 5 feet of relief. The facility is not located in areas prone to flooding during a 100-year flood, based on information from the Illinois Department of Transportation, Division of Water Resources.

The surface water features are the Little Calumet River, associated man-made marinas, and Lake Cottage Grove. The river flows east into Lake Michigan. The water level in the river is approximately 10 feet below the land surface elevation at the facility. The water level in Lake Cottage Grove is approximately 5 feet below the land surface at the facility.

Stormwater at the facility is routed by onsite sewers to the municipal sanitary sewer system. Therefore, no surface water from the site is discharged to either the Little Calumet River or Lake Cottage Grove.

Land Use

Land use in the vicinity of the Dolton Recycle Center is shown on Figure I-3-1, which is an aerial photo taken in 1987. Property use immediately surrounding the Center are open land

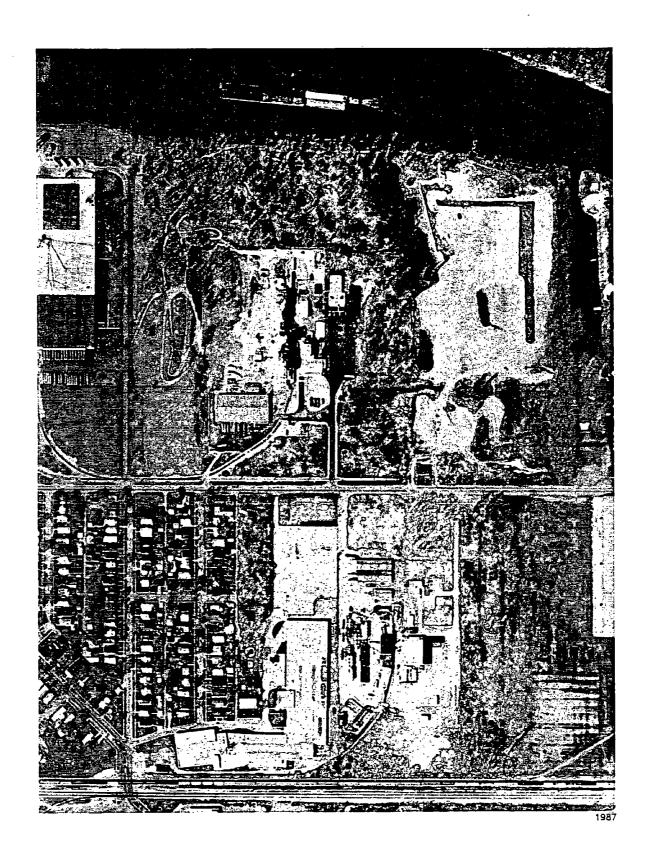


FIGURE 1-3-1 :LAND USE, DOLTON RECYCLE CENTER AND VICINITY (1987)
I-3-2

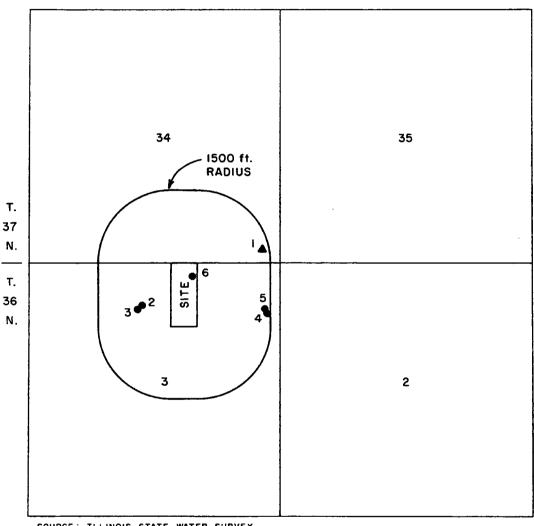
to the north and east, a railroad corridor to the south, and a residential area to the west.

The Stauffer Chemical/Rhone-Poulenc Basic Chemical Plant is located northwest of the Dolton Recycle Center. Fertilizer is produced at the plant. The plant has underground storage tanks, and is a large quantity generator of RCRA hazardous ignitable (D001), corrosive (D002), and reactive (D003) wastes.

Ground-Water Use

Ground-water use in the vicinity of the Dolton Recycle Center is shown on Figure I-3-2. There are five industrial water supply wells and one domestic supply well in the vicinity of the center. A listing of these wells is presented in Table I-3-1. All wells are completed in the dolomite aquifer and range in depth from 210 to 1,700 feet below ground surface.

R. 14 E.



SOURCE: ILLINOIS STATE WATER SURVEY

EXPLANATION

- INDUSTRIAL USE WATER WELL
- DOMESTIC USE WATER WELL

NOTE: WELLS DESCRIBED IN TABLE I-3-1

FIGURE I-3-2 : GROUND - WATER USE IN VICINITY OF SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

Table 1-3-1. Water Use Wells in Vicinity of Dolton Recycle Center.

Map ID (Figure 1-3-2)	Owner	Driller	Date	Permit	Depth (ft)	Use
1	Brenda Brooks	Knierim	December 1978	x082956	210	Domestic
2	Chaines Inc.	Kramer	1946		300	Industrial
3	Chaines Inc.	Kramer	1946		300	Industrial
4	Dolton Realty Corp. #1	Layne-Western	September 1954		1704	Industrial
5	Metro Glass Co.	Layne-Western	September 1954		1704	Industrial
6	Safety-Kleen Corp.	Coman Drilling Co.	April 1989		300	Industrial

CHAPTER I-4

REFERENCES

- Eastep, Lawrence W., January 12, 1994. Letter from Illinois Environmental Protection Agency to Safety-Kleen Concerning Identification of Solid Waste Management Units under RCRA Corrective Action.
- Illinois Environmental Protection Agency, May 30, 1993, RCRA Facility Assessment, Safety-Kleen Corp. - Dolton Recycle Center, Cook County, Dolton, Illinois (Part B Log #120).
- ______, September 29, 1993. Hazardous Waste Management RCRA
 Part B Permit, Safety-Kleen Enviro Systems
 (ILD980613913).
- Safety-Kleen Corp., November 1993. Environmental Information Package, Dolton Recycle Center.

APPENDIX I-A

RCRA WASTES POTENTIALLY
MANAGED AT DOLTON RECYCLE CENTER

Revised: November, 1993

The facility is inspected by the Illinois Environmental Protection Agency (IEPA) to assure compliance with RCRA. The site is normally found to be in compliance.

Process Information:

Types of Hazardous Wastes accepted

D001	Ignitable
F001	Spent halogenated solvents
F002	Spent halogenated solvents
F003	Spent non-halogenated solvents
F004	Spent non-halogenated solvents
F005	Spent non-halogenated solvents
-	Still bottoms and sludges from recovery of the solvents above

The following "Wastes from Specific Sources":

K022	K049	K085	K095
K048	K052	K086	K096

The following "Commercial Chemical Products, Chemical Intermediates or Off-Spec Materials":

U001	U056	U080	U124	U196
U002 .	U057	U083	U125	U210
U003	U068	U084	U140	U211
U019	U069	U107	U154	U213
U031	U070	U108	U159	U220
U037	U071	U110	U161	U226
U043	U072	U112	U162	U227
U044	U075	U113	U165	U228
U051	U077	U117	U169	U239
U052	U078	U118	U171	U359
U055	U079	U121	U188	

The following "TCLP Wastes": D004 - D043

Actual acceptance of wastes are subject to the IEPA Waste Authorization Program and Safety-Kleen's Waste Pre-Qualification requirements. Wastes are received in accordance with the Waste Analysis Plan and analytical protocols. There are lab facilities on site and if necessary outside laboratories are used to supplement the facility's analytical capabilities.

Storage:

Per Part B Permit: Containers 263,780 gal. Tanks 900,000 gal.

Treatment:

The facility recycles spent solvents by gravity separation and distillation, evaporation, drying, and blending.

Table 4.1

CATAGORIES OF HAZARDOUS WASTES HANDLED AT DOLTON RECYCLING CENTER

Waste No.	<u>Description</u>
F001	The following spent halogenated solvents used in degreasing: tetrachloroethylene, trichloroethylene, methylene chloride, l,l,l-trichloroethane, carbon tetrachloride, chlorinated fluorocarbons, spent solvent mixtures/blends used in degreasing, and still bottoms from the recovery of these spent solvents and spent solvent mixtures.
F002	The following spent halogenated solvents: tetrachloro- ethylene, methylene chloride, trichloroethylene, 1,1,1- trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2- trifluoroethane, orthodichlorobenzene, trichlorofluoro- methane, 1,1,2-trichloroethane, spent solvent mixtures and blends, and the still bottoms from the recovery of these spent solvents and spent solvent mixtures.
F003	The following spent non-halogenated solvents: xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-buryl alcohol, cyclohexanone, methanol, spent solvent mixtures and blends, and the still bottoms from the recovery of these spent solvents and spent solvent mixtures.
F004	The following spent non-halogenated solvents: cresols and cresylic acid, nitrobenzene, spent solvent mixtures and blends, and still bottoms from the recovery of these spent solvents and spent solvent mixtures.
F005	The following spent non-halogenated solvents: toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, 2-nitropropane, spent solvent mixtures and blends, and the still bottoms from the recovery of these spent solvents and spent solvent mixtures.
D001	Solid waste that exhibits the characteristic of ignitability, but is not listed as a hazardous waste.
D002	Solid waste that exhibits the characteristic of corrosivity, but is not listed as a hazardous waste.
D005	Solid waste exhibiting the characteristic of EP toxicity for barium at 100 mg/L or more.

TABLE 4.1

Waste No.	<u>Description</u>
U162	Methyl methacrylate
U165	Naphthalene
U169	Nitrobenzene .
U171	2-Nitropropane
U188	Phenol
U191	2-Picoline
U196	Pyridine
U210	Tetrachloroethylene
U211	Methane, tetrachloro
U213	Tetrahydrofuran
U220	Toluene
U226	1,1,1-Trichloroethane
U227	1,1,2-Trichloroethane
U228	Trichloroethylene
U239	Xylene
U359	2-Ethoxyethanol

APPENDIX I-B

EMERGENCY RESPONSE PLANNING
DOLTON RECYCLE CENTER

FIRE DEPARTMENT

14022 PARK AVE, DOLTON, ILLINOIS 60419

Business Phone: (708) 849-2145 - Emergency Phone: (708) 849-2141

FIRE PREVENTION BUREAU

(708) 201-3253



August 9, 1993

Illinois Environmental Protection Agency 2200 Churchill Road P.O. Box 19276 Springfield, IL 62794-9276 Attn: Mr. Bradley A. Frost RECEIVED

Dear Mr. Frost and IEPA,

I request that the following letter be entered into the public record concerning the public comments solicited in regards to the application of Safety-Kleen Corporation, Dolton, Illinois to operate a Hazardous Waste Recovery Site:

To whom it may concern:

Hy name is Thomas E. Jacobs. I have been a Dolton resident all my life. I am a Captain on the Dolton Fire Department with fifteen years of service, and the Fire Inspector for the past year.

Safety-Kleen Corporation has been responsible for taking over an eyesore and turning it into a showplace. Anyone interested in operating a solvent-recovery operation should tour this facility.

Safety-Kleen has gone beyond our strict fire safety requirements installing fire protection which is state-of-the-art and over and above what is required. In all my dealings with the personnel at Safety-Kleen Dolton, I find a genuine concern for my views and recommendations. Many times, even a hint of a recommendation will be enough, and all of a sudden I will find it done.

We have reworked our emergency plan; installed new Incident Command Boxes which contain pre-plans, MSDS sheets, tank quantities, site plans, etc. at two separate locations remote of the plant; installed the same information in our Fire Department Command Van in case we can't use the on-site boxes; installed a new Knox-Box Locking Key Box which contains emergency access swipe cards and keys to entry gates in case of power failure; etc.

I have received outstanding cooperation from Mr. John Valerius, Facility Manager; Mr. Gene Rosner, Plant Engineer; Mr. Dane Vanaman, Safety Coordinator, just to name a few. We have conducted a complete tour of the facility for all Dolton and Riverdale firefighters, and will be inviting other surrounding towns at a later date. I am also in the process of arranging a training with

August 9, 1993

the Third District Hazardous Materials Team.

All in all, I feel that Safety-Kleen Dolton is a responsible operation with outstanding personnel and state-of-the-art fire and safety protection and awareness. I only wish there were more corporations with Safety-Kleen's concern for their neighbors and employees in Dolton. I have received nothing but cooperation from the management and employees of the Safety-Kleen Corporation Dolton Recycle Facility, and feel confident this relationship will continue.

Respectfully,

Captain Thomas Jacobs

Fire Inspector

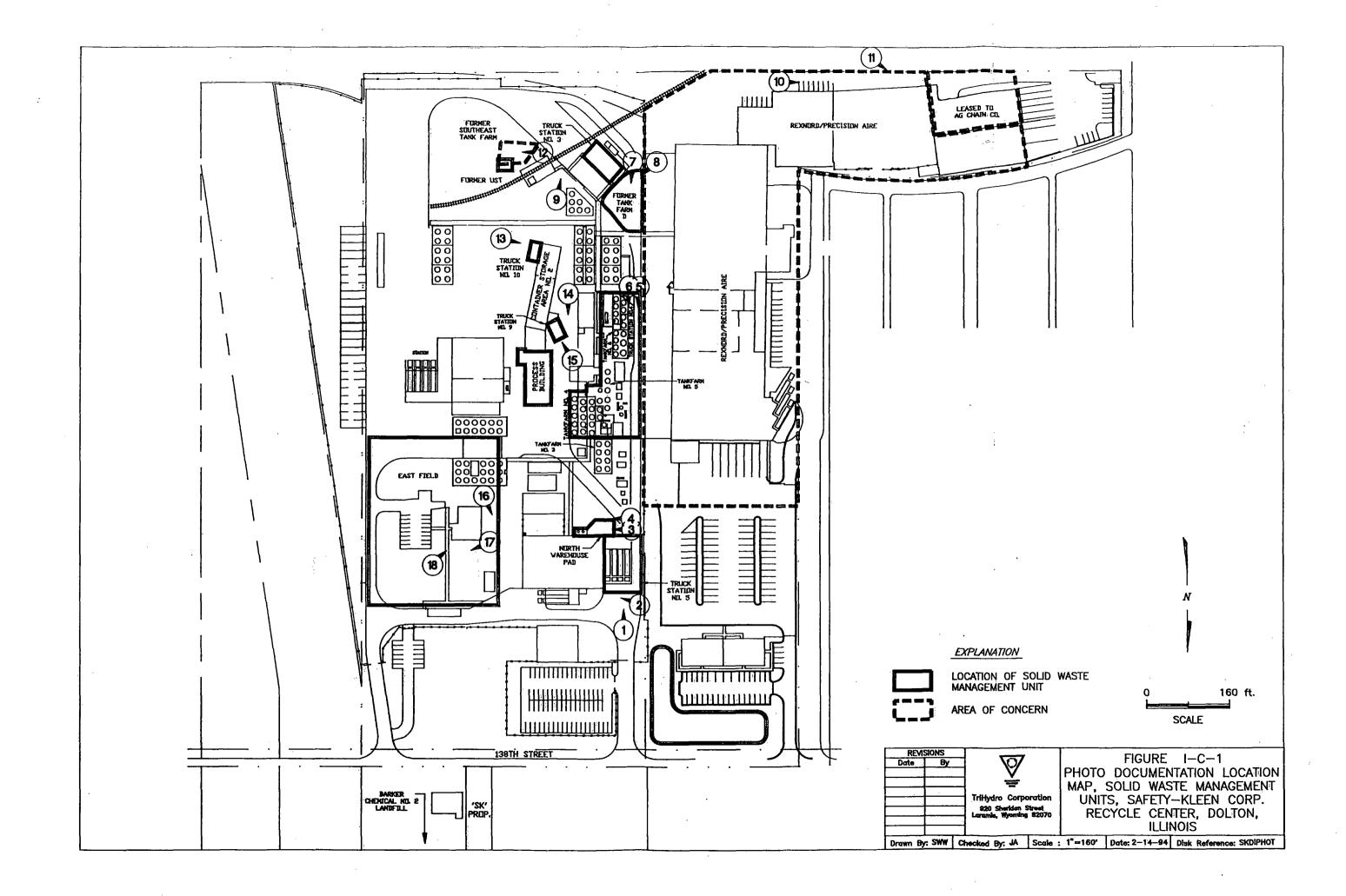
cc: Mayor Hart

Trustees Clayton, Herzog, Lewis, Myers, Panozzo, Yamini

Chief Kapusta

APPENDIX I-C

PHOTODOCUMENTATION CURRENT CONDITIONS DOLTON RECYCLE CENTER

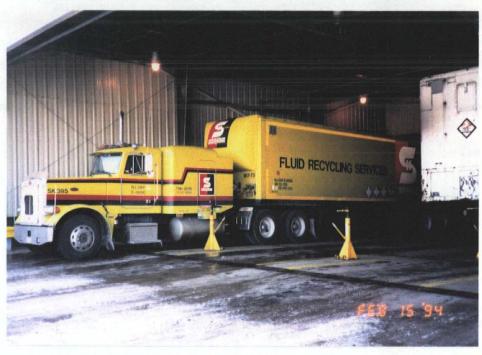




1. TRUCK STATION NO. 5

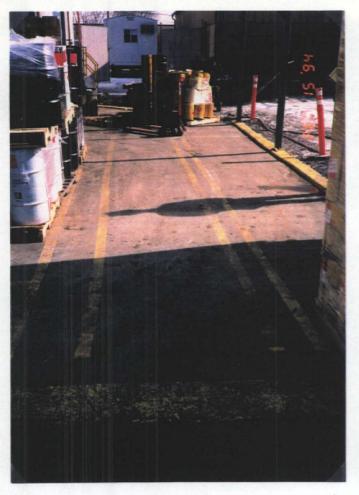


3. NORTH WAREHOUSE PAD (FORMER TRUCK STATION NO. 6)

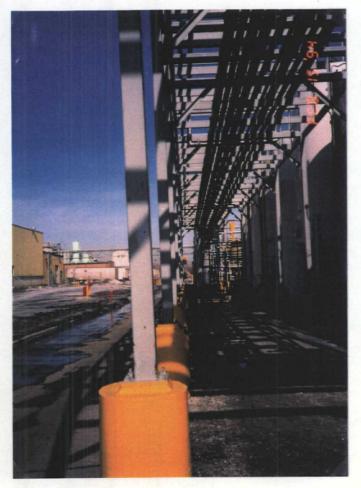


2. TRUCK STATION NO. 5

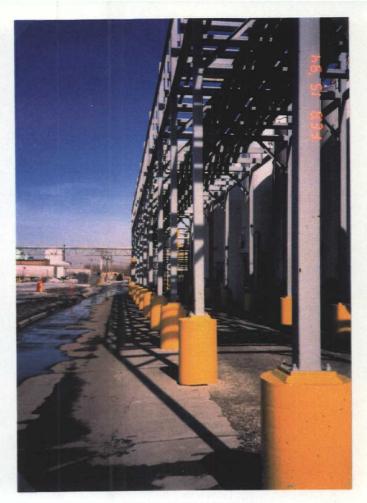
FIGURE I-C-2.1 :PHOTODOCUMENTATION, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS



4. NORTH WAREHOUSE PAD (FORMER TRUCK STATION NO. 6)

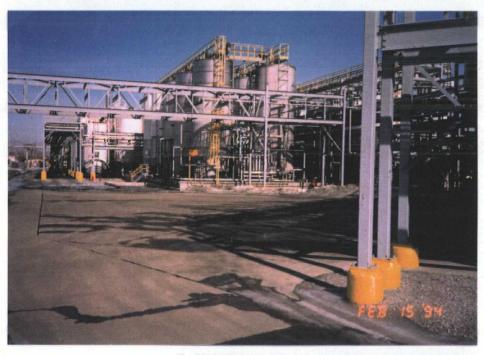


6. TRUCK STATION NO. 4



5. WEST TANK FARM/DRIVEWAY

FIGURE I-C-2.2 :PHOTODOCUMENTATION, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS



7. FORMER TANK FARM D

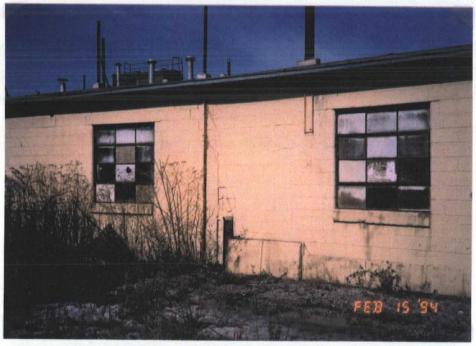


9. TRUCK STATION NO. 3



8. TRUCK STATION NO. 3

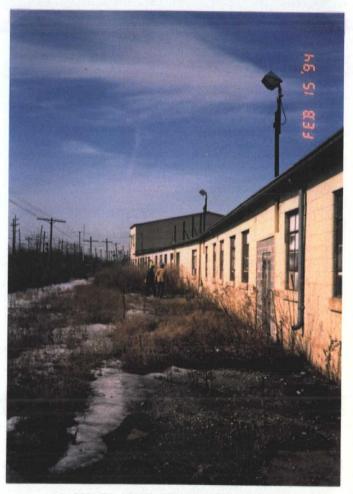
FIGURE I-C-2.3 :PHOTODOCUMENTATION, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS



11. FORMER ABOVE-GROUND STORAGE TANKS, PRECISION AIRE PROPERTY

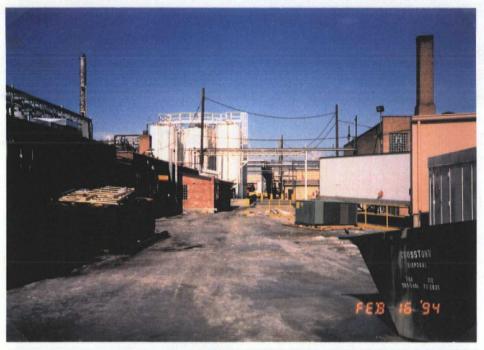


12. FORMER TANK FARM AREA



10. FORMER ABOVE—GROUND STORAGE TANKS PRECISION AIRE PROPERTY

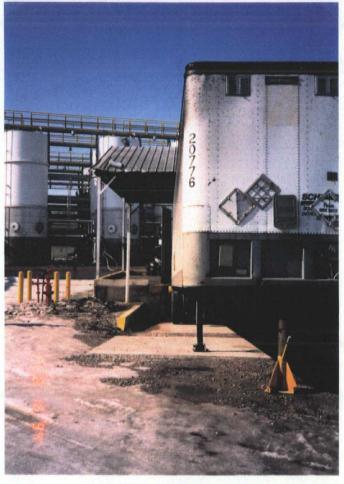
FIGURE I-C-2.4 :PHOTODOCUMENTATION, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS



14. TRUCK STATION NO. 9



15. TRUCK STATION NO. 9

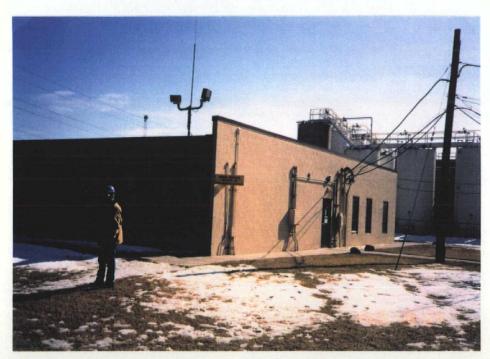


13. TRUCK STATION NO. 10

FIGURE I-C-2.5 :PHOTODOCUMENTATION, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS



16. EAST FIELD



18. EAST FIELD



17. EAST FIELD

FIGURE I-C-2.6 :PHOTODOCUMENTATION, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

APPENDIX I-D

RELEASE HISTORY
DOLTON RECYCLE CENTER

APPENDIX I-D

RELEASE HISTORY

The following is a list of known releases that have occurred at the Dolton Facility. Some of the releases were the result of past waste management practices. Others may be considered incidental to handling large volumes of wastes. The list has been obtained from the Part B Permit and from the U.S. Environmental Protection Agency Emergency Response Notification System (ERNS) database.

Barker Chemical No. 2 Area

November 19, 1980 - During inspections by USEPA, there was march 5, 1981 reported evidence of the possible disposal/storage of wastes offsite at 700 East 138th Street, Chicago, Illinois, without a permit.

East Field

December 1979 (Barker)	Approximately 400 drums were excavated. Drums were located in the east field, an
(= 3.33-22 ,	area which had been used by Barker Chemical for disposal activities. The exca-
•	vated drums were disposed of at Paxton Landfill, Chicago, Illinois.

November 19, 1980 -	During inspections by USEPA, there was
March 5, 1981	reported evidence of disposal, spilling,
(Barker)	and dumping of hazardous waste in the
·	East Field and leaking containers of
	hazardous wastes being stored in the
	East Field.

September 30, 1988 While digging for a sewer line east of Container Storage Area 1, twelve crushed drums containing dried paint uncovered.

This area is part of the old East Field.

Process Building

June 11, 1987	40 gallons of synthetic fuel material were spilled outside the storage tank area. The contaminated soil was immediately excavated and disposed of offsite.
March 15, 1990	Observed leak from seal on ballmill during VSI.

Container Storage Area 2

February 15, 1972	Fire	in	south	warehouse.	Few	details
(Barker)	are a	vai	lable.			

May 25, 1973 Fire in south warehouse. Few details are available.

West Tank Farm

August 2, 1979	During	inspection	n by I	EPA, s	spillage	e of
(Barker)	hazardo	us wastes	observ	red in	waste	sol-
	vent st	orage tank	area.			

	During inspections by USEPA, there was
March 5, 1981	reported evidence of leaking valves on
(Barker)	waste feed lines to storage tanks con-
	taining hazardous wastes.

February 3, 1982	1,000 gallons of water-paint waste mix-
(McKesson)	ture were spilled inside the Tank Farm.
	Some of the material entered the sewer
	system, and the material was recovered
	from the sewer system for processing.

February 2, 1985	Ruptured disk on the distillation column
(McKesson)	reboiler unit opened due to over-pres-
	surization which resulted in air emis-
	sions of approximately 200 gallons of
	toluene.

April 6, 1986 (McKesson)	A pump pit in the J tank farm area caught on fire. The fire damaged three
(menessen)	tanks located west of the existing lab building. Approximately 30,000 gallons
	of solvent consisting of isopropyl alco-
	hol, toluene, vinyl acetate, and MIBK
	were lost by combustion.

November 13, 1986 (McKesson)	9,000 gallons of plant process wa were released within the tank dike ar	
	Approximately 25 cubic yards of d	like
	soil were removed and disposed of o	ff-
	site.	

April	5,	10 gallons of hazardous waste fuel were
		spilled, due to a flange failure on a
		transfer line. Recovered with sorbents.
		Some material may have entered storm
		sewer. Called local fire department.

Former Tank Farm D

April 14, 1983 (McKesson)	Spill of 200 gallons of distilled lacquer thinner while loading a tank truck. Nearest sewer diked. Material collected and transferred to a feedstock tank for reprocessing.
June 9, 1983 (McKesson)	Spill of 348 gallons of distilled wash solvent from broken hose. Area diked with absorbent; trenches dug to collect liquid which was pumped back into tanks for reprocessing.
July 7, 1985 (McKesson)	1,715 gallons of 1,1,1-trichloroethane solvent were spilled during transfer of the material into a product storage tank. The spill occurred within the diked area and most of the material was recovered. The impacted soil was excavated and disposed of offsite.
April 15, 1988	Due to an underground pipeline leak, approximately 2,000 gallons of gun cleaner solvent were released. The pipeline was uncovered and the impacted soil was excavated and disposed of offsite.

Several other spills have occurred into reinforced concrete secondary containment areas since 1983, and have been immediately cleaned up. McKesson and S-K have reported these spills to the Illinois Environmental Protection Agency.

APPENDIX I-E

INTEGRITY REPORT PROCESS BUILDING

PROJECT: 815

INTEGRITY EVALUATION REPORT SWMU NO. 1 - PROCESS BUILDING SAFETY-KLEEN CORP. RECYCLE CENTER DOLTON, ILLINOIS

February 28, 1994

Prepared For:

Safety-Kleen Corp. 1000 N. Randall Road Elgin, IL 60123

Prepared By:

Jack Bedessem, P.E. TriHydro Corporation 920 Sheridan Street Laramie, WY 82070

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<u>Sect</u> :	<u>ion</u>	<u>Page</u>
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2.0	Scope of Evaluation	1
3.0	Description of Process Area	3
4.0	Results of Integrity Evaluation	4
5.0	Results and Conclusions	7
6.0	References	9

LIST OF FIGURES

<u>'igure</u>	<u>Page</u>
1 Location of Process Building, Safety-Kleen Corp. Recycle Center, Dolton, Illinois	. 2
<pre>2 Process Building/Process Area and Ballmill Room, Safety-Kleen Corp. Recycle Center, Dolton,</pre>	
Illinois	. 5

1.0 Introduction

Safety-Kleen Corp. (S-K) owns and operates a recycling facility in Dolton, Illinois (ILD 980613913). The Dolton Recycle Center is permitted to store and treat RCRA hazardous waste. As a condition of the RCRA permit, the Illinois Environmental Protection Agency (IEPA) requires S-K to conduct a RCRA Facility Investigation (RFI) in three phases. Phase I of the RFI is to determine if the designated solid waste management units (SWMUs) have released hazardous wastes or hazardous constituents to the soil or air.

In November 1993, S-K requested that IEPA revise the approach to the required corrective action investigations. Following a site inspection and discussions with S-K in January 1994, IEPA revised the list of designated SWMUs and requirements for the corrective action investigations. The modifications and revisions are presented in a draft letter from IEPA dated January 27, 1994. These modifications and revisions are incorporated into the RFI Phase I Workplan (March 1994).

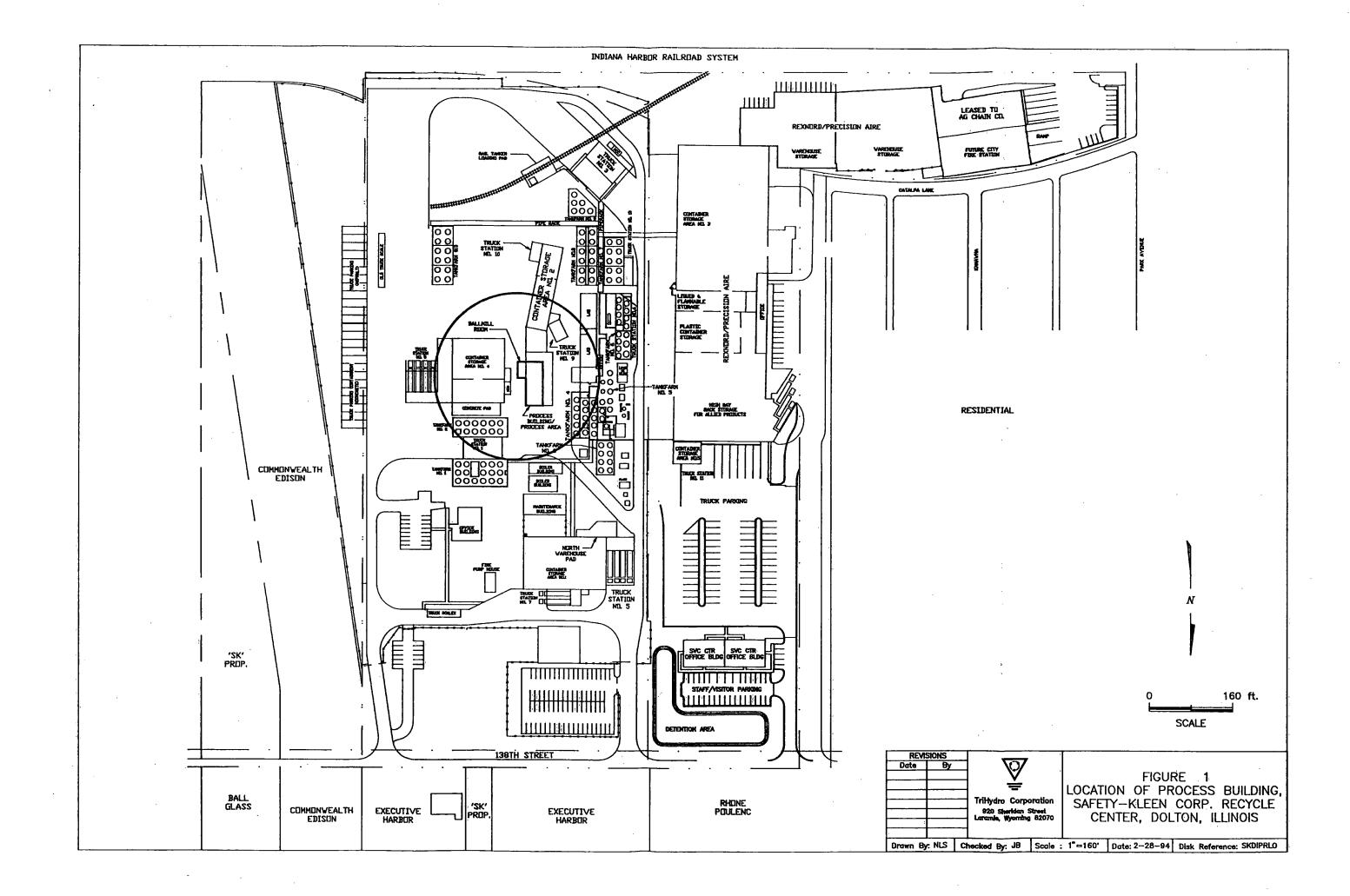
SWMU No. 1 is designated as the Process Area/Process Building in the South Warehouse. In the January 1994 letter, IEPA requested that S-K conduct an integrity evaluation of the Process Area. Figure 1 shows the location of the Process Area in the Dolton Recycle Center. The purpose of this report is to present the results of the Process Area evaluation.

2.0 Scope of Evaluation

The integrity evaluation was conducted on February 17, 1994, by an independent registered professional engineer. As requested by IEPA, the evaluation consisted of an assessment of the base of the Process Area to:

- 1. Determine if the integrity of the pavement and secondary containment structures is such that former releases have not had a direct migration pathway to underlying or surrounding soils; and
- 2. Determine if future releases have a potential to migrate to underlying or surrounding soils.

The integrity evaluation consisted of a detailed visual inspection of the floor, curbing, and coating of the Process Area base and measurement of the capacity of the containment



structures. A review of past spill reports and Process Area operations was also conducted to evaluate the integrity of the containment structures to contain releases and mitigate migration to underlying and surrounding soils. The integrity evaluation was conducted in accordance with applicable industry standards (ACI 201.1R-92, ACI 515.1R-79/85) for surveying concrete in service.

3.0 Description of Process Area

S-K commenced operation of the Dolton Recycle Center in 1987, including the Process Area in the South Warehouse. The Process Building was constructed in the 1950's by Barker Chemical Company. McKesson Envirosystems commenced operation of the facility in 1981. Minimal information is available regarding activities in the Process Area/Process Building prior to S-K commencing operations in 1987.

According to S-K personnel, the Process Building is identified as the Process Area and Ballmill Room in the northeast corner of the South Warehouse. The indoor area has been used since at least 1983 to liquify containerized semisolid wastes prior to fuel blending in the West Tank Farm. The units contained in the process area include:

- <u>Drum Emptying Unit Vat #1</u>. A 600-gallon carbon steel mixing bin used for manually dumping pourable wastes entering the fuels program. Liquids with grindable solids are transferred to the ballmill, and the resulting liquids are pumped to Tank Farm #6. Nongrindable solids are containerized, and shipped offsite from Truck Station No. 9 or No. 10 for incineration.
- <u>Automated Drum Handling Unit Vat #2</u>. A 1,600-gallon carbon and stainless steel mixing bin used for automatically dumping pourable wastes. Wastes are processed for the fuels program in the same manner as at Vat #1. Nongrindable solids are containerized, and shipped offsite from Truck Station No. 9 or No. 10 for incineration.
- <u>Ballmill</u>. High solids content wastes are recirculated through a ball grinder barrel (150 gallons running capacity) constructed of stainless and carbon steel. Grindable solids are transferred to Tank Farm No. 6 (fuels program).

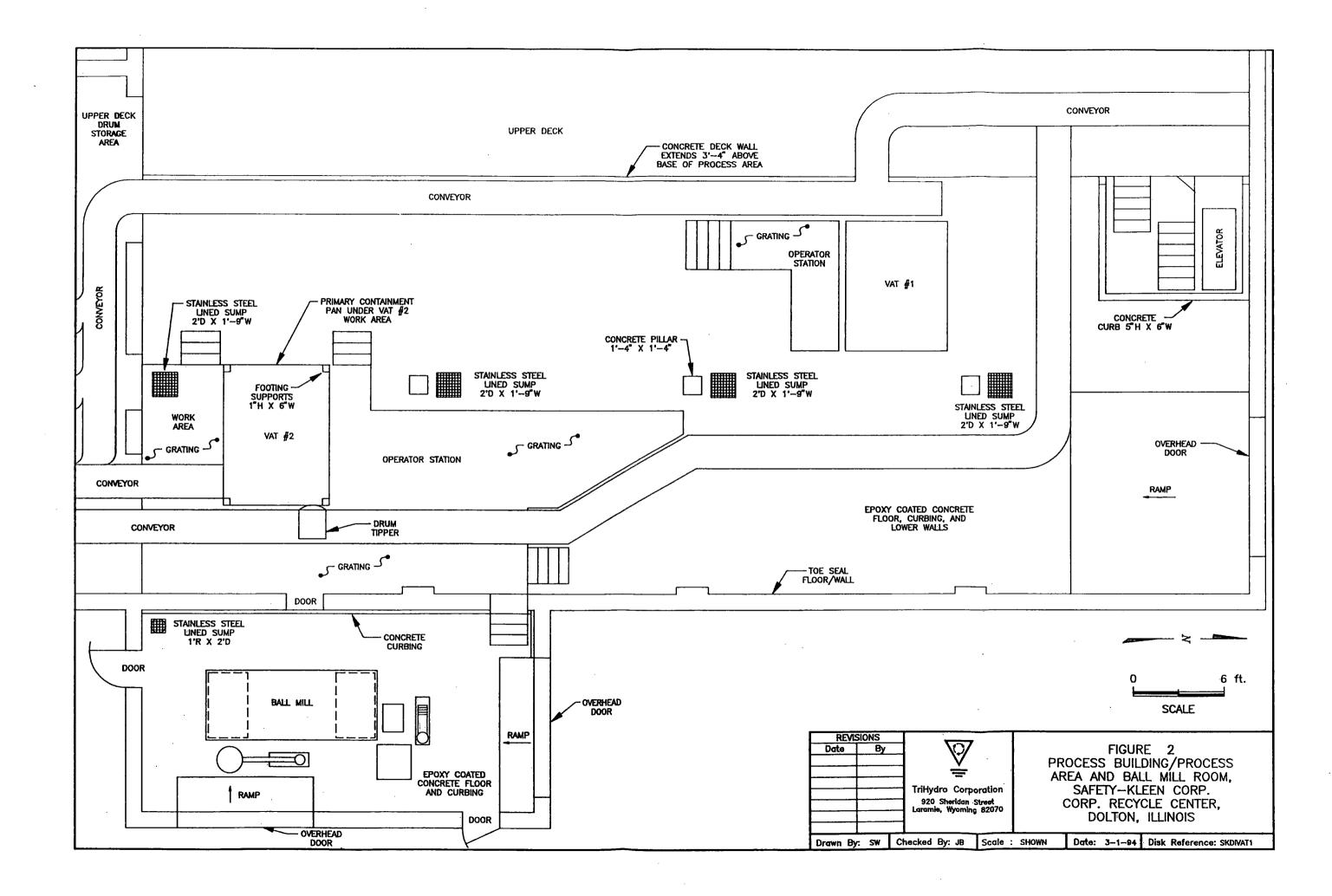
 <u>Ballmill Sump</u>. A 40-gallon stainless steel-lined sump with metal grating to collect spills in the ballmill.

Wastes managed in this area are generally containerized in 55-gallon drums until processing. Following processing, liquids are pumped to Tank Farm No. 6 for fuels blending. Nongrindable solids are containerized in drums and shipped from Truck Station No. 9 or No. 10 for incineration.

S-K upgraded the secondary containment systems in the Process Area and Ballmill Room in 1988; however, no plans or specifications were available at the site. The current layout and details of the Process Area and Ballmill Room are shown on Figure 2. Photographs which describe the current state of the Process Area and Ballmill Room are presented in Attachment A.

4.0 Results of Integrity Evaluation

- The Process Area and Ballmill Room are of concrete block construction with concrete floors, curbing, ramping, and footings. The floors, curbing, and lower walls are coated with an epoxy polymer barrier/sealant of Semstone 245 (Sentry Polymers, Freeport, Texas).
- 2. Specifications for the epoxy polymer coating, which were provided by S-K, are included in Attachment B. The chemical resistance guide indicates that this coating is compatible with the wastes/chemicals managed in the Process Area and Ballmill Room.
- 3. The epoxy polymer coating/sealant was installed over the concrete pavement, curbing and lower walls as a positive-side barrier system. Positive-side barrier systems are defined as having the coating/sealant installed on the same side as the potential hydrostatic pressure.
- 4. Ramping or curbing is provided at all doorways to contain spills and minimize potential for migration to soils surrounding or outside of the buildings. The ramps are sloped inward, away from the doors.
- 5. Four shallow stainless steel-lined sumps were present in the center of the Process Area. The capacity of each sump was determined to be approximately 3.5 gallons.



- 6. One shallow stainless steel-lined sump was present in the southeast corner of the Ballmill Room. The capacity of this sump was determined to be approximately 40 gallons.
- 7. All sumps were covered with metal grating. The interface between the sumps and the concrete floor was sealed with a flat layered bead of epoxy sealant.
- 8. The toe joints between the floor and the concrete equipment footings, curbing, and ramps appeared to be sealed with a bead of cement grout. The toe joints were coated with the epoxy polymer sealant.
- 9. Several sealed hair-line cracks were observed in the concrete floor of the Ballmill Room and one was observed in the ramp of the Process Area. The small hair-line cracks were sealed with an epoxy coating and did not appear to provide a pathway for migration of liquids to underlying soils.
- 10. According to the Plant Engineer, S-K maintains a policy of inspecting secondary containment areas and repairing cracks/deterioration of the structures/coatings on a regular basis. Cracks are sealed with a flat layered bead of the epoxy polymer sealant.
- 11. Access to floor areas under the equipment was limited due to facility operations. A primary secondary containment pan was observed to exist under Vat No. 2. Three small spill containment pans were observed under Vat No. 1.
- 12. Except for areas immediately under the enclosed equipment, the floor of the Process Area and Ballmill Room was relatively clean. The epoxy coating was gray in color with a glossy finish. No signs of serious abrasion were observed on the main floor areas.
- 13. The surface of the coated Process Area floor was slightly irregular in the central area between Vat No. 1 and Vat No. 2. The irregularities in the floor surface may have resulted during finish work, troweling of a base sub-coating, or filling of joints. No construction or expansion joints were observed below the epoxy polymer coating.
- 14. Anchor bolts were used to secure the supports of the conveyors and stairways to the concrete floor.

All anchor bolts appeared to be tight, sealing the base plates securely to the coated flooring.

- 15. The gray epoxy polymer coating extended up the lower portion of the exterior walls a height of 5 inches (curb height) to approximately 1 foot. Based on the measured dimensions, the minimum secondary containment capacities of the Process Area and Ballmill Room (Figure 2) are approximately 8,800 gallons and 1,600 gallons, respectively.
- 16. Several fires and spills are documented to have occurred in the South Warehouse; however, no fires have occurred since S-K commenced operation in 1987. Review of S-K records indicate all spills were containerized in the secondary containment structures and cleaned up with absorbent and/or vacuum equipment.
- 17. Review of spill reports indicate that releases of waste fuel ranging in size from less than 0.5 gallons to 300 gallons have occurred in the Process Area and/or Ballmill room. The majority of the releases were reported to be less than five gallons.

5.0 Results and Conclusions

S-K commenced operations at this facility in 1987. S-K upgraded the Process Area and Ballmill Room in 1988. The Process Area has been used to liquify semi-solid wastes prior to fuel blending since at least 1983. Limited information was available regarding operations, configurations, and releases in these areas prior to S-K purchase of the property.

The base and coatings in the Process Area and Ballmill Room appeared to be in good sound condition during the February 1994 inspection. S-K maintains a policy of inspecting secondary containment areas and repairing cracks/deterioration of the structures/coatings on a regular basis. The capacities of the secondary containment structures exceed the capacities of the units in the Process Area (2,200 gallons) and Ballmill Room (150 gallons) and quantities of previously documented releases.

The primary objective of this evaluation was to assess the integrity of the pavement and secondary containment structures relative to preventing the migration of releases to underlying and surrounding soils. As constructed and maintained, there appears to be minimal potential for release in these areas to migrate to underlying and/or surrounding soils. Therefore, based on the results of this integrity evaluation, there are no recommendations for further corrective actions in the South Warehouse Process Area at this time.

6.0 References

- Guide for Making a Condition Survey of Concrete in Service, American Concrete Institute, ACI 201.1R-92.
- A Guide to the Use of Waterproofing, Dampproofing, Protective and Decorative Barrier Systems for Concrete, American Concrete Institute, ACI 515.1R-79, Revised 1985.
- Personal Communication, John Valerius, Plant manager, Safety-Kleen Corp. Recycle Center, Dolton, Illinois, February 17, 1994.
- Personal Communication, Gene Rosner, Plant Engineer, Safety-Kleen Corp. Recycle Center, Dolton, Illinois, February 17, 1994.

ATTACHMENT A

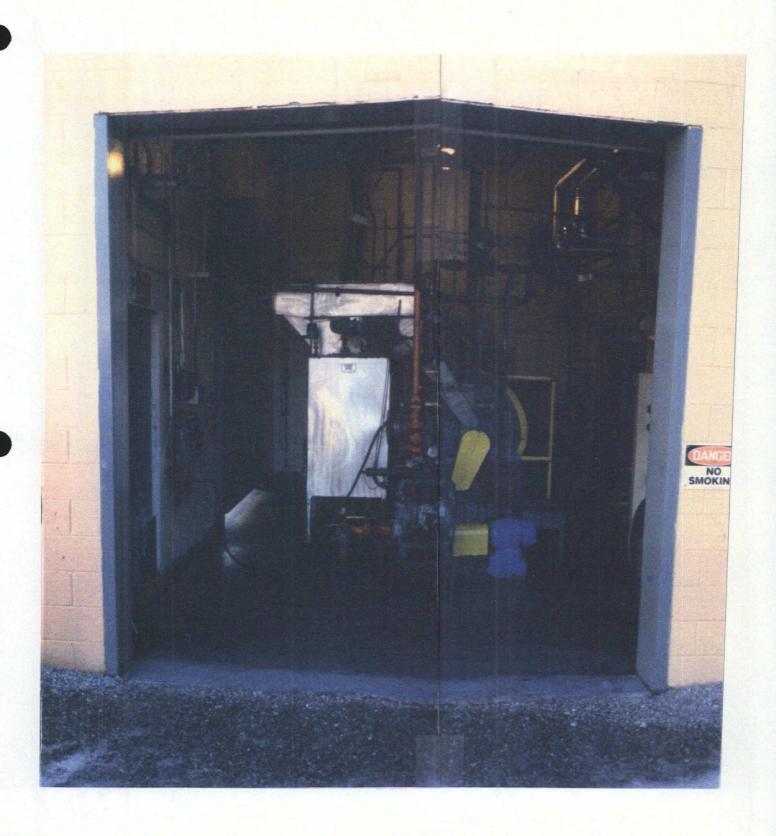
PHOTOGRAPHS
PROCESS BUILDING AND BELLMILL ROOM
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS

PROCESS BUILDING/PROCESS AREA AND BALLMILL ROOM INTEGRITY EVALUATION PHOTOGRAPHIC DOCUMENTATION SAFETY-KLEEN CORP. RECYCLE CENTER DOLTON, ILLINOIS FEBRUARY 1994

Photo No.	Area	View
1	Ballmill Rm	East overhead door
2	Ballmill Rm	South overhead door
3	Ballmill Rm	Ramp at south overhead door
4	Ballmill Rm	Toe seal on east wall/floor
5	Ballmill Rm	Ramp at east overhead door
6	Ballmill Rm	Stainless steel sump/grating
7	Ballmill Rm	Floor/footings below ballmill
8	Process Area	Ramp at south overhead door
9	Process Area	Toe seal on east wall/floor
10	Process Area	West view of Vat #1
11	Process Area	North stainless steel lined sump
12	Process Area	Operator station Vat #2
13	Process Area	Southeast view of Vat #2
14	Process Area	East view of Vat #2 work area
15	Process Area	Toe seal on west wall/floor
16		
17	!	



РНОТО 1



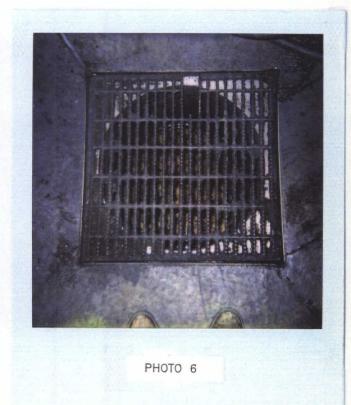
РНОТО 2











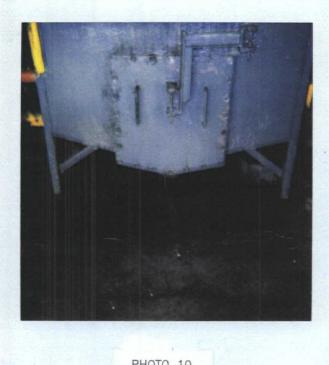








РНОТО 8



РНОТО 10

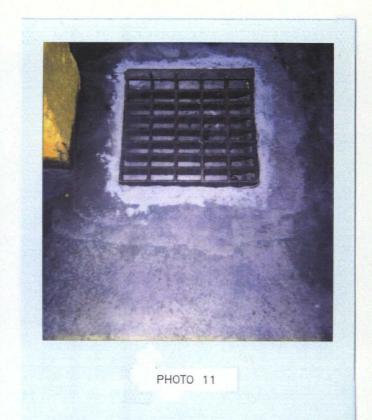




PHOTO 12



РНОТО 13



РНОТО 14



РНОТО 15

ATTACHMENT B

SPECIFICATION EPOXY/POLYMER COATING

FROM SK-DOLTON RC

FROM S-K ENGINEERING

TO 813077457729

PAGE.002/008

TO DOLTON RC

PAGE . 2022/2028

TECHNICAL BUILDEIN

DESCRIPTION AND USES:

SEMSTONE 245 is a high performance specialty coating for concrete. Its unique formulation makes it suitable for constant immersion service in chlorinated solvents, such as:

- Methylene chloride
- Ethylene dichloride
- Trichloroethylene

In addition, SEMSTONE 245 offers excellent resistance to a very broadrange of other hazardous and corrosive chemicals including benzene. phenol. ketones, alcohols and chromic acid, as well as such commonly encountered items as 98% sulfuric acid and 50% caustic. This makes it the preferred choice for protecting hazardous waste handling facilities and other areas that will regularly see exposure to a wide variety of difficult chemicals.

Other features include:

- Very rapid cure, providing quick turnaround of projects.
- Can be applied at temperatures as low as 35°F.
- Can be applied over damp concrete.

PACKAGING/COVERAGE:

SEMSTONE 245 is available in 1 gallon, 3 gallon and 25 gallon units. Each unit consists of premeasured Part A and Part B components. A bagged Part C thixotropic agent is added for work on vertical surfaces.

Application thickness may vary from 25 mils to 125 mils, depending on expected service conditions (i.e., chemical exposure, temperature, traffic load and other mechanical abuse, immersion service vs. splash-spill, etc.), Consult Sentry Polymers for specific thickness recommendations.

In addition, coverage rates will be effected by the condition of surface being coated (degraded vs. smooth, steel vs. concrete, etc.).

To figure THEORETICAL coverage per gallon, divide desired mil thickness into 1,604. (For example, theoretical coverage for a 60 mil thickness is: 1,604 divided by 60 = 26.73 square feet per gallon.)

For practical coverage, make necessary allowances for condition of the substrate, working conditions, waste, spillage, etc.

SEMSTONE 245

High Performance Coating



FROM S-K ENGINEERING

TO DOLTON RC

PAGE. 2023/2028

TYPICAL PROPERTIES:

Solids, by Volume		1009		
Color		Buff (Selected other colors options		
Weight per Mixed Gallon		10 1		
Cure Times (Approximate	e):			
	Foot	Chemical		
Temperature	Traffic	Service"		
35°F	24 hrs	7 days		
55°F	8 hrs	48 hrs.		
80°F	4 hrs	24 hrs.		

"For immersion service in chlorinated solvents, the coating must be postcured at 150°F for 12 hours.

RELATED AND ANCRLARY PRODUCTS:

SEMSTONE 140 Epoxy Floor Coating - Cold Temperature Formulation SEMSTONE 140-S Epoxy Coating and Lining SEMSTONE 300 Epoxy Polymer Concrete SEMSTONE 500 Epoxy Putry SEM-CRETE Rapid Hardening Underlayment Mortar

Refer to separate technical bulletin on each products for its uses, application instructions, etc.

STORAGE AND SHELF LIFE:

Keep SEMSTONE 245 components tightly sealed in their original containers until ready for use. Store unopened at 50°F-90°F, out of direct sunlight. At least 24 hours immediately prior to use, store all components (A, B, C, and aggregate) at 80°F-90°F, to facilitate handling.

Properly stored, SEMSTONE 245 has a minimum shelf life of one year. Refer to batch number on label for date of manufacture.







Zinc Chloride



This guide is intended as an aid in determining the potential usefulness of SEASTONE 245 as a protective bearier against chemical exposure. Each application should be evaluated according to its particular circumstances and conditions.

KEY: 1 = Suitable for constant immersion

2 = Subside for shorter term containment and continual spillage

3 - Subside for intermittent soils when followed promptly with water this hang

NR - Not recommended

C = Consult Sentry Polymers

 $^{\alpha}$ = This chamical will attack the silice aggregate in the system. When the system is applied, be especially constit that all aggregate is locally encapsulated with SEMSTONE 245.

"" = For constant immersion service, colling must be postcured 12 hours at 150°F.

	RATING		RATING		. RATING
Acetic Acid. 10%	1	Cyclonazane	2	Naprithalene	1
Acetic Acid, 30%	2	Cyclehazanol	2	NEDIC Acid, 5%	2***
Acetic Acid, Glacial	3	Ovcloheranona	2	Nitric Acid, 30%	3000
Acetone	ĭ	Diesel Fuel	ī	Nitric Acid, 50%	NR
Acrylic Acid, up to 25 %	2	Dietryi Benzene	1	Nikrobenzene	1
Acrylonitrillo	2	Dimetry Amiline	ĺ	n-Octyl Alcohol	1
Action Acid	2	Epichloroliydrin	1	Olis	1
Alam (Aluminum Potassium	Suffate) 1	Estryl Acetate	1	Otele Acid	Ž.
Austriaum Chloride	1	Ethyl Acrylate	1	Oleum	2000
Aturnizaro Fluorica	10	Ethyl Alcehol	1	Oznik Acid	2
Aluminum Hydroxide	1	Ethyl Bengana	· 1	Parchioroethylene	
Alteriment Norman	ī	Pant Chloride	126	Parchioric Acid	ž
Alumirum Suffate	1	Ethylene Dichlorido (EDC)	100	Phenoi	Ž
Ammonia	ž	Ethylene Glycol	1	Phosphoric Acid, 50%	1
Ammonium Bisulfite	<u> </u>	Fathy Acids	1	Phosphoric Acid, 85%	1
Ammonara Chlorida	1	Ferric Chlorics	Jese.	Phosphorous Acid	2
Ammonium Hydroxida	1	Ferric Nitrate	1	Potassium Carbonate	· i
Ammonium Nitrate	1	Ferric Suttena	1	Potassium Chloride	
Atomonium Sulfene	ī	Fentus Chioride	ī	Potassium Dictromate	
n-Armyt Alcohol	1	Pinosilicić Acid	1=	Potessium Hydroxide	
Anithe	7	Pormelderede	_ 1	Potassium Nicote	. 1
Sarkon Chiocide	•	Formic Acid	2	Propionic Acid	Ž.
Banium Hydroxide	î	Fical Oil	ī	Silver Nitrate	2000
Bartem Suffate	1	Gasoline	ī	Sleewoll	1
Barlum Sulfide	ī	Gycerine	ī	Sodium Acetate	ī
Benzene	i	Hectane	ī	Sodium Bioachonate	ī
Bemana Sulfonic Acid	î	Harane	ī	Sodium Bisulfate	ī
Benzole Acid		Hydrotromic Acid	Ž	Sodium Bistuffite	÷
Black Ugior, Puto Mili	i	Hydrophiana Acid. 15%		Sodium Camonera	. :
Beech	ċ	Hydrochionic Acid, 37%	1200	Sodium Chloride	
Bonic Acid	ĭ	Pydroffueric Acid	- 1 -	Society Chlorite	2.
Brine	1	Hydrogen Peroxide	2	Sodium Hydroxide, 10%	· 1
Bromide, Licuid	พ ี่	Hydrogen Suticle	ī	Section Pageroxide, 50%	ī
Bromide Gas (Dry & Wet)	3	Inocropy Alcohol	ī	Socium Hypochiorite	č
Bund Acetare	1	let fuel	1	Socium Sulfate	ĭ
Busyl Acrylate	· 1	Kerosene	, <u>1</u>	Scoken Sulfide	Ĭ
n-Butyl Alcohol	ī	Lactic Acid	2	Stannie Chionice	ī
Butyl Cellosoive Solvent	ī	Lauryl Chloride	ž	Starnous Chloride	1
n-Butanic Acid	2	Load Asstate	1	Stearic Acid	i
Cadmaim Chloride	1	Linseed Oil	1	Styrene	1
Calcium Chlorida	1	Lithium Bromide	1	Sugar/Sucrose	1
Cascium Hydroxida	ī	Lithium Chloride	1	Suffix Dicoide	1
Calcium Hypochiorite	Ē	Lithium Hypochiorite	C	Suffusic Acid, 10%	• 1
Calcium Niterate	i	Lithium Hydroxide	1	Suitaric Acid, 50%	ī
Calcium Sulfate		Megnesium Bisulfite	i	Sulfuric Acid, 96%	1000
Calcum Suffice	<u> </u>	Magnesium Carbonete	1	Talt Oil	1
Carbon Dioxide 636	1	Magnesium Chloride	1	Tannic Acid	
Carpon Dissulfide	2	Magnesium Hydroxida	1	Terteric Acid	1
Carbon Tetracritorios	1	Magnesium Sulfate	1	Tetrahydrofuran	. 3
Chiorine Dioxide	_ 2	Mateic Acid	2	Toluene	ĩ
Chloring Gas (Dry & Wet)	3	Mercuric Chioride	. 1	Teluena Sulfonic Acid	1
Chlorine Water	ž	Mercurous Chloride	1	Trichloracetic Acid	2_
Chlorobenzena	ĭ	Matranol	1	Trichloroethane	
Chiproform	128	Methyl Chloride	2	Trictioroethylene	1
Chronic Acid. 25%	1***	Methylene Chlonde	1==	Trisodium Phosphate	J
Chromic Acid, 50%	2===	Matter Ethyl Katone	1	Urea	ļ
Copper Nitrate	1	Mathyl Methacrylate	3	Water. Deionized	į
Copper Suffitte	1	Mineral Spirits	1	Water, Demineralized	1
Com Oil	1	Monochloroecetic Acid	2	Water, Distilled	2
Crude Oil, Sour	1	Monostranolamine	1	Xytono	1

Munistic Acid





Crude Oil, Sweet

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FROM S-K ENGINEERING

APPLICATION GLIDELINES

IMPORTANT NOTES

- 1. Work on vertical surfaces requires the addition of Part C thixotrope.
- 2. For manual applications, use only 1 gation and 3 gallon units. The mixed material has a very short pot life, so plan your work accordingly.

TEMPERATURE CONSIDERATIONS

- 1. Throughout the application process, the temperature of the surface to be coated should be 35°F -95°f.
- 2. Below 75°F, the components will thicken noticeably, making manual applications extremely difficult.
- 3. When coating steel, halt application if the temperature falls within 5°F of the dew point. (This is not necessary when coating concrete.)
- 4. Bubbles may appear in the SEMSTONE 245 costing if it is applied over concrete in direct sunlight, or when temperatures are rising. This is due to the expansion of air and/or moisture trapped in the concrete. It is especially true of air entrained concrete.

For best results, shade the work area and apply SEMSTONE 245 when temperatures are falling.

5. Store all materials (components A, B, C and aggregate) at 80°F · 90°F for at least 24 hours before use, to facilitate handling.

SURFACE PREPARATION - GENERAL

- 1. Surfaces must be free of dirt, dust, oil, grease, chemicals and other contaminants immediately prior to applying each coat of SEMSTONE 245.
- For the initial cost, concrete surfaces can be dame.

However, for recosts, all surfaces must be dry.

SURFACE PREPARATION OF CONCRETE

1. New concrete generally should be cured a minimum of 28 days.

NOTE: Check with Sentry Polymers for recommendistions regarding concrete cured less than 28 days.

- 2. Concrete must be structurally sound and must not contain any accelerators or curing compounds.
- 3. Remove all oil and grease.
- 4. Remove all surface taltance and expose sound concrete. We recommend abrasive blasting to do this.

However, other methods, such as acid etching and neutralizing, may be used.

5. In general, any existing coating should be completely removed.

In certain instances, this may not be necessary, but consult with Sentry Polymers first.

Always remove coatings which have failed due to lack of adhesion or thermal shock.

- 6. Locate all expansion joints, control joints, floor drains, equipment base plates and mid-floor termination points. Handle them as per Sentry's Construction Details.
- 7. Honeycombs or any form voids in vertical surfaces must be filled.

Above 50°F, use SEMSTONE 140 with Part C thixotrope and aggregate added.

Below 50°F, use SEMSTONE 140-CT with Part C aggregate added.

- 8. If the concrete is damo:
 - a. Flush thoroughly with clear water. Steam or hot water is recommended, if available.
 - b. Remove all standing water.





SURFACE PREPARATION OF STEEL (NON-IMMERSION SERVICE ONLY)

- Abrasive blast steel surfaces to a near white metal finish with 1 · 2 mil anchor profile. (Ref. SSPCSP-10)
- All outside comers must be ground smooth and rounded.
- Round all inside corners to a minimum 1/2" radius with SEMSTONE 500 Epoxy Putty.

MASKING

Mask surfaces that are not to be costed. This material is difficult to remove, once applied.

APPLICATION EQUIPMENT

1. For spraying, use only a specially equipped plural component rig. Specifications are as follows:

Graco King Hydracat (or equivalent); 28:1 pump; 2.3 GPM, 4:1 mix ratio; inlet air pressure on pump set at 75-120 psi.

Two 15 gallon heated hopper tanks. Set heater at 95°F.

in-line heater on resin outlet, set at 110° F.

High pressure solvent pump.

insulated hoses, 3/8 in: ID. maximum length of 100 ft.

Graco Silver Gun, or equivalent, equipped with a reversible, self-cleaning tip, orifice size .035 - .041 inches.

No filters or internal screens.

- 2. For manual applications:
 - a. Floors preferred method is to spread with serrated soucceee, then backroll.

As a second choice, trowel or brush could be used.

b. Walls - use roller or brush.

MIXING AND APPLICATION

- 1. The components must be individually agitated immediately prior to use:
 - Part A Bland each Part A component to a uniform consistency in its individual container, using a Jiffy type mixer.
 - Part B Stir each Part B component to a uniform color in its individual container.
- 2. For work on vertical surfaces, add Part C.

Part C comes in premeasured bags.

For a one gallon unit and three gallon units, add one premeasured bag to each Part A.

For 25 gallon units, add one premeasured bag to each bucket of Part A and each bucket of Part B. (NOTE-There are 4 buckets of Part A and one bucket of Part B in a 25-gallon unit.)

Using a Jiffy type mixer, blend the Part C in until it is evenly dispersed, (about 1 • 2 minutes).

NOTE: Adding Part C darkens the color of SEMSTONE 245 somewhat.

3. Skip this step if you are spraying.

If mixing for application by hand:

Pour Part A into a clean mixing container of adequate capacity.

Add Part B.

Mix thoroughly for two minutes using a Jiffy type mixer.

The pot life of the mixed material will be about 15 minutes at 80°F. So, use immediately. For work on floors, etc., we suggest that you immediately dump the mixed material onto the surface and spread it.

NOTE: The premeasured quantities of each component have been carefully set. Any variation in these premeasured ratios will adversely effect performance. So, mix only complete units. If any of the components are spilled, discard the batch.



FEB 18 '94 09:37

FROM S-K ENGINEERING

TO DOLTON RC

PROE. 227/228

Material should be applied in even coats.

If spraying, use multidirectional passes to insure positive coverage and a proper film build.

If you notice a marbling or streaking effect while spraying, stop immediately. The spray equipment is not mixing the material properly or the mix ratios are incorrect. Check your equipment.

This marbied or streaked material will not cure properly and must be removed. Scrape the material off and then solvent wash the area with MEK or toluene. Alternately, abrasive blasting may be used to remove the material. In either case the end result is to have a non-sticky surface to recoat.

Adding aggregate:

a. Horizontal surfaces

To obtain a thicker coating and/or a nonskid finish, aggregate may be broadcast into the coating before it begins to set.

Since SEMSTONE 245 sets quickly, you must plan the work carefully. One worker should apply the coating, and another should follow immediately, broadcasting the aggregate. However, keep the work separated. Do not allow aggregate to be broadcast ahead of the applicator.

Broadcast aggregate until dry layer is achieved.

Allow the coating to cure.

Remove the excess aggregate.

Use only clean, dry, bagged and well graded 20/40 mesh sitica or quartz sand containing not less than 97.5% silicon dioxide. Aggregate may be either round or angular.

When broadcasting aggregate in a large or congested area, it may be desirable for workers to wear spiked shoes to enable them to walk out onto the coating without disturbing it.

An optional topcoat of SEMSTONE 245 may be applied to protect the aggregate and obtain a more cleanable surface. The topcoat should be of neat material applied at a cover rate of 150-160 sq. ft, per gallon. The surface must be

kept dry and free of contamination prior to applying this topcoat.



b. Vertical surfaces

Refer to Sentry's supplemental guidelines for adding Part C and sand.

- 6. Prepare surfaces for intercoat adhesion as follows:
 - a. Allow SEMSTONE 245 to cure until jelled before recoating.
 - b. If the surface has cured firm to the touch, but less than 24 hours, it must be washed with soap and water, rinsed and dried before recoating.
 - c. Surfaces cured beyond 24 hours must be washed with soap and water, rinsed, dried and lightly sanded or abrasive blasted.
 - d. Important: While SEMSTONE 245 can be applied over damp concrete, for recoeting, the surface. must be dry.
- 7. Post-curing for immersion service in chloringted solvents:

The coating must be postcured if it will be used for continuous immersion service in chiorinated solvents.

Tarp the coated area and heat it at 150°F for at least 12 hours.

8. Spark Testing Steel

Spark testing is recommended for coated steel in immersion service.

Voltage setting = 1250 x √ Coating Thickness (in mils)

9. If work is interrupted, and at the end of the day, terminate the coating in a straight line.

CLEANUP

Clean all tools and equipment with Xylene. MEK or toluene.



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SAFETY PRECAUTIONS

FOR INDUSTRIAL USE ONLY.

Both the mixed product and his separate A and B components can be extremely infrating to skin. eyes and the respiratory system.

Avoid contact with eyes and skin; do not ingest or mhale.

When spraying in a confined area, wear a fresh air hood and make provision for forced ventilation.

At all other times, wear a NIOSH approved respirator sultable for organic vapors when working with this product or its components.

When working with SEMSTONE 245, always wear chemical goggles, rubber gloves, and appropriete work clothing.

Prolonged or repeated exposure to the unreacted Part A and Part B components of SEMSTONE 245 may cause skin infration or allergic reactions.

Refer to material safety data shoets regarding individual components.

NOTES:

PROJECT: 815

PART II

NATURE AND EXTENT OF IMPACTS

RCRA FACILITY INVESTIGATION PHASE I RELEASE ASSESSMENT WORKPLAN DOLTON, ILLINOIS, SERVICE CENTER



TriHydro Corporation

920 Sheridan Street Laramie, Wyoming 82070 FAX: (307) 745-7729

(307) 745-7474

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CHAPTER II-1

INTRODUCTION

Six soil investigations and two ground-water investigations have been conducted at the facility since 1979. A considerable amount of qualitative information and quantitative data have been collected on soil lithology, soil quality, ground-water occurrence, ground-water flow direction, and ground-water quality in the vicinity of the solid waste management units (SWMUs) designated in the Part B Permit. This information and these quantitative data have been used in the design of the Phase I Sampling and Analysis Plan presented in Part IV of this Workplan.

Soils have been physically described at 63 locations at the facility. Soil quality has been qualitatively described at all 63 locations, and quantitatively analyzed at 21 of those locations. In addition, a soil gas survey was conducted at 27 locations to identify the presence of volatile organic compounds (VOCs) in shallow soils, and an electromagnetic conductivity survey was conducted at 110 locations to identify elevated soil salinity and potentially buried ferrous materials. Based on this existing database, the soils at the facility appear to be unimpacted, except in the following possible areas:

- A section of the East Field where 12 drums were buried. The drums and impacted soil were excavated in 1991, after the soils investigations were done in 1979 and 1988. Therefore, corrective action in 1991 may have eliminated the soil impacts.
- The central part of the West Tank Farm and the area near Truck Station No. 9.
- Former Tank Farm D and the Former Southeast Tank Farm.

Five non-halogenated volatile organic compounds (xylenes, toluene, ethylbenzene, methyl isobutyl ketone, acetone) were detected in these areas. Metals concentrations were at expected background levels. Semi-volatile organic compounds have not been analyzed in these areas.

A ground-water investigation is not part of the Phase I investigation. However, two ground-water investigations have been conducted, and ground-water impacts in a shallow perched zone (but not in the underlying dolomite aquifer) have been indicated in the vicinity of the East Field, West Tank Farm and former Tank Farm D/former Southeast Tank Farm. Therefore,

S-K intends to conduct voluntary investigative work during Phase I to determine ground-water flow directions and characterize ground-water impacts in the shallow perched zone in order to better focus the investigation during Phase II.

CHAPTER II-2

SOILS CONDITIONS

Considerable information regarding soil conditions has been collected during previous investigations at the Dolton Recycle Center. Soils data have been collected at 63 locations on the facility during previous investigations. These previous investigations include:

- A 1979 geotechnical investigation to support plant expansion.
- A 1981 geotechnical investigation to support plant expansion.
- A 1983 environmental investigation in the vicinity of former underground storage tanks (USTs).
- A 1988 due diligence environmental investigation associated with property ownership transfer.
- A 1990 due diligence environmental investigation associated with property ownership transfer.
- A 1990-1991 environmental investigation to document clean closure of two fuel oil UST areas.

During these six investigations, qualitative and quantitative information has been generated in the vicinity of the solid waste management units designed in the Part B Permit. The following soils information has been collected on the site:

- Physical descriptions of the soils at 63 locations.
- Qualitative descriptions of soil quality at the same 63 locations, and quantitative data on soil quality at 21 locations.
- A soil gas survey at 27 locations to indicate the presence of volatile organic compounds (VOCs).
- An electromagnetic conductivity survey at 110 locations to indicate the possible presence of buried objects and/or elevated salinity.

These data collected during the six previous investigations have led to the identification of three impacted areas at the facility as well as site-specific conditions which limit the extent of soil impacts. This information has satisfied the

objectives of Phase I of the RCRA Facility Investigation (RFI) to a large extent, and thus is described in detail below.

Lithology

Borehole logs in the vicinity of the site were obtained from the Illinois State Geological Survey to determine the regional lithology (Appendix II-A). Based on the information in these logs, the sediment in the area consists of low permeability lake silts and clays, with a few interbedded sand lenses. The sediments become more granular to the north. However, at least 30 feet of low permeability silts and clays were documented in all borehole logs (Figure II-2-1).

Under the low permeability silts and clays is the Silurian-age Niagaran Dolomite Series. The formation is underlain progressively by the Maquoqueta Shale and the Galena-Platteville Series (mostly carbonates). The bedrock structure dips easterly to the center of the Michigan Basin (Figure II-2-2) (ATEC, 1988).

Physical soil conditions at the facility have been described at the 63 locations shown on Figure II-2-3. Logs for borings at the facility are included in Appendix II-B. The lithology of the site is well defined because of the number and distribution of logged boreholes.

Lithologic cross sections across the site are shown on Figures II-2-4 and II-2-5. Grain-size data are provided in Appendix II-C. The lithology is consistent across the site. At the surface is a layer of topsoil (silty clay loam) or fill which is 1 to 4 feet thick. The fill consists of clay, silt, sand, gravel and rubble. The area backfilled with clay, which is shown on Figure II-2-4, corresponds geographically with the area where the drums were excavated.

Under the topsoil or fill are silts and fine sands of the Carmi Member of the Equality Formation. This member consists of local discontinuous lenses of clay and medium to coarsegrained sand interbedded in the silt and fine sand matrix. The thickness of the silts and fine sands varies from up to 15 feet in the southeastern corner of the site to absent in the northeastern part of the site.

Under the silts and fine sands is the Wadsworth Member of the Wedron Formation, which is the dominant soil unit underlying the entire site. These deposits are low permeability, gray to brown silty clays and clayey silts. The clays are 35 to 40 feet thick across the entire site, and extend to

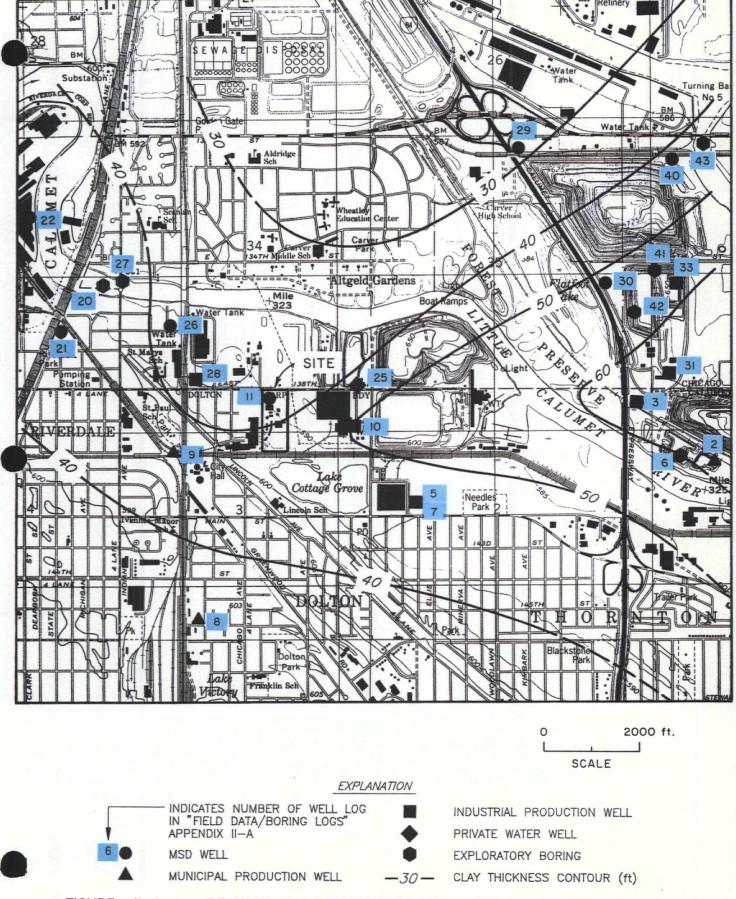
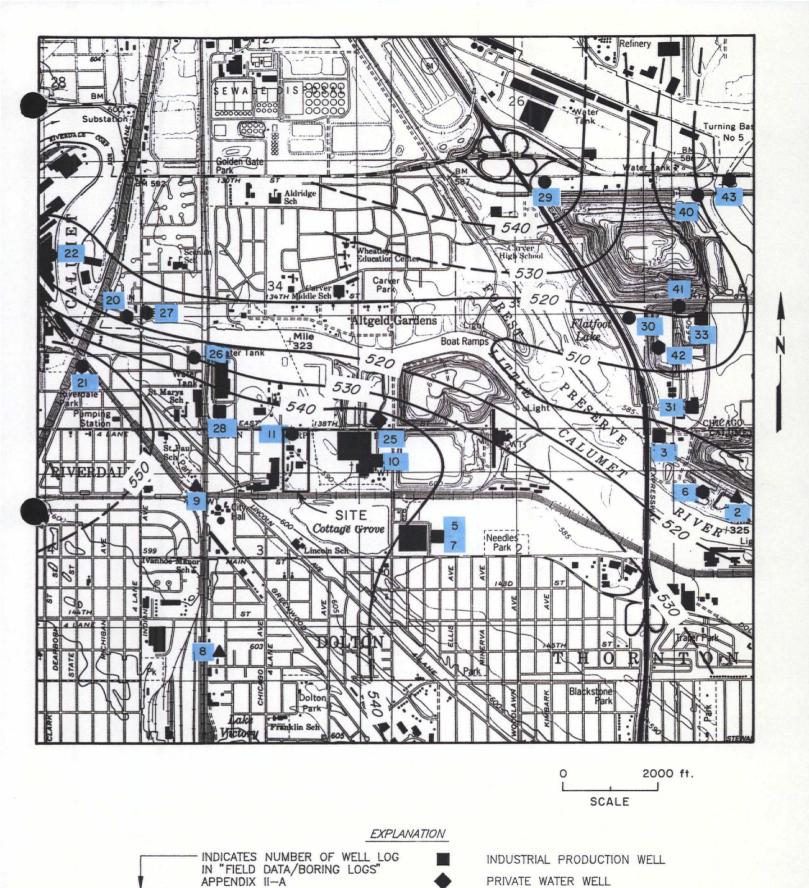


FIGURE II-2-1 :REGIONAL CLAY THICKNESS MAP, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (from ATEC, 1988)



MSD WELL

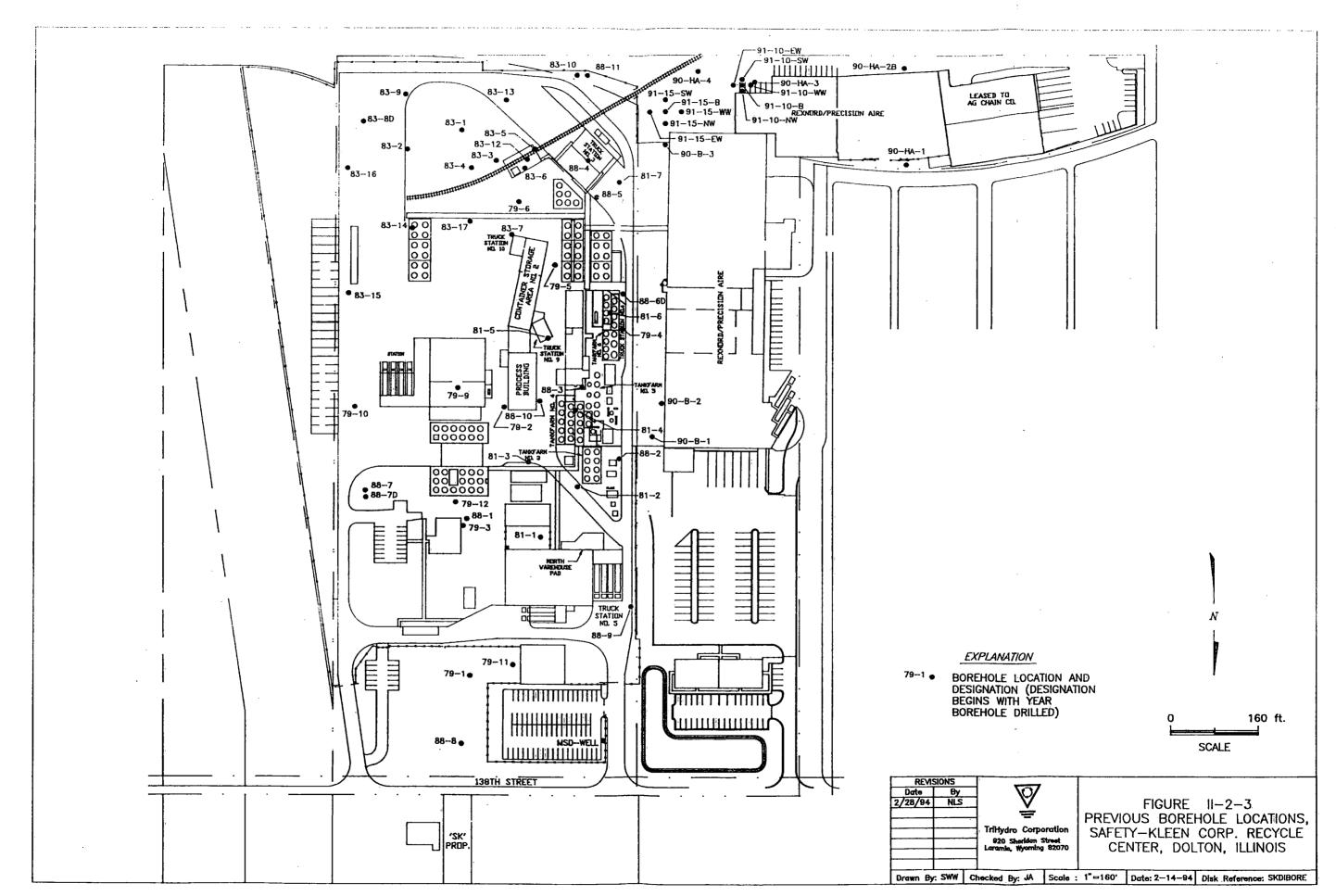
EXPLORATORY BORING

MUNICIPAL PRODUCTION WELL

-520

TOP OF BEDROCK CONTOUR (ft-msi)

FIGURE II-2-2 :REGIONAL TOP OF BEDROCK MAP, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (from ATEC, 1988)



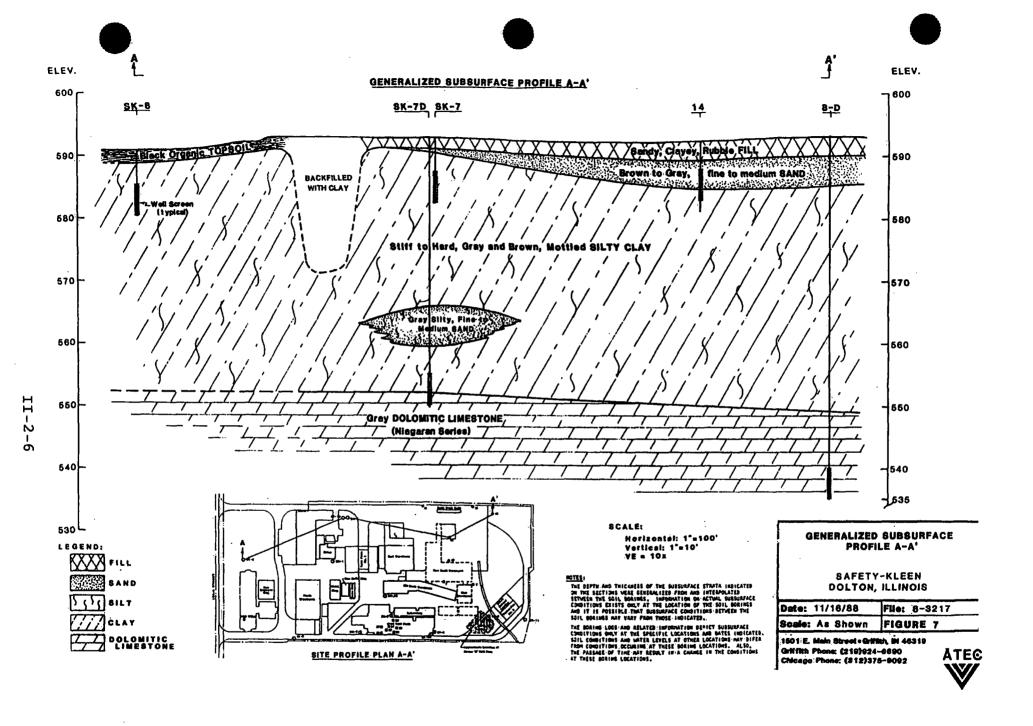


FIGURE 11-2-4 : CROSS SECTION A-A', SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

bedrock. The composition of the clays changes from stiff at shallow depths to very stiff and hard near bedrock.

Four boreholes located near the four corners of the site (83-8D, 88-6D, MSD, and 88-7D) were drilled into bedrock. The borehole log for MSD is included in Appendix II-A and for the other three sites in Appendix II-B. Bedrock was encountered in all boreholes at approximately 45 feet below ground surface. The uppermost bedrock is a hard, gray dolomite which is moderately fractured in the upper several feet, but less fractured with depth. No open voids were encountered in the bedrock during drilling.

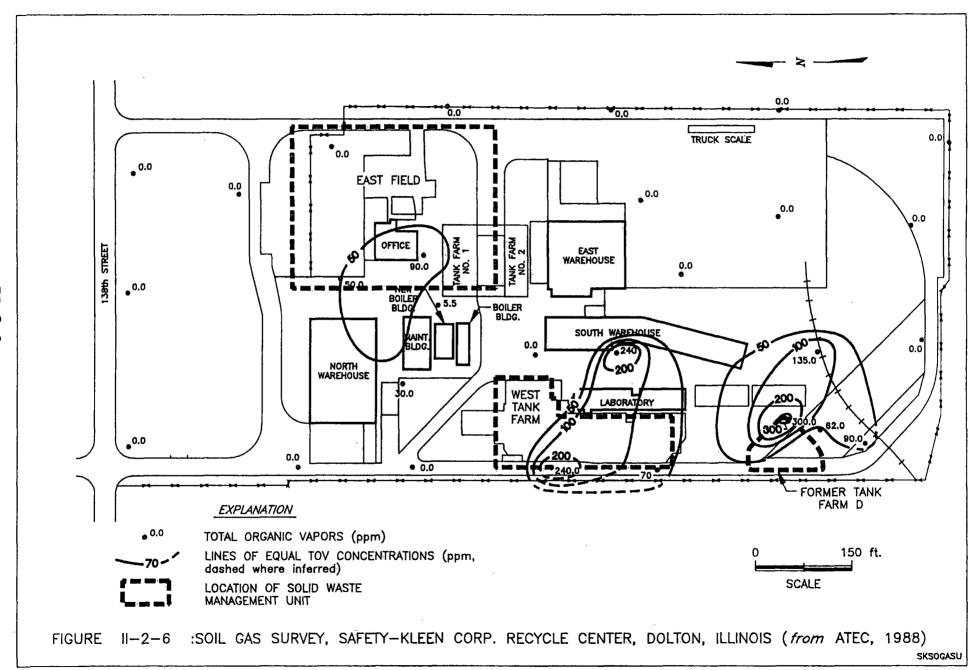
Soil Gas Survey

A soil gas survey was conducted at 27 locations across the plant site in 1988 to identify areas where VOCs may have been present in shallow soils. The survey did not include the Rexnord/Precision Aire property or TriStamp/Agri-Chain lease. Samples were collected through a screened, galvanized steel probe driven to a depth of approximately 2.5 feet below ground surface. Soil gas was purged through the probe by applying a vacuum to an air-tight desiccation chamber connected to an HnU photoionization detector (PID).

Following the purging of approximately five liters of soil gas, total organic vapor (TOV) concentrations in the soil gas were measured with the PID and recorded. The results are shown on Figure II-2-6. Three areas of elevated TOV concentrations were identified by the soil gas survey:

- East Field, south of the office building, where 12 drums were uncovered during installation of a sewer line in 1991. The maximum TOV concentration was 90 units.
- West Tank Farm/Truck Station No. 9, located in the west-central part of the facility. The maximum TOV concentration was 240 units.
- At and east of Former Tank Farm D. The maximum TOV concentration was 300 units.

In all other areas of the plant site, TOV concentrations were within the background range of 10 units or less.



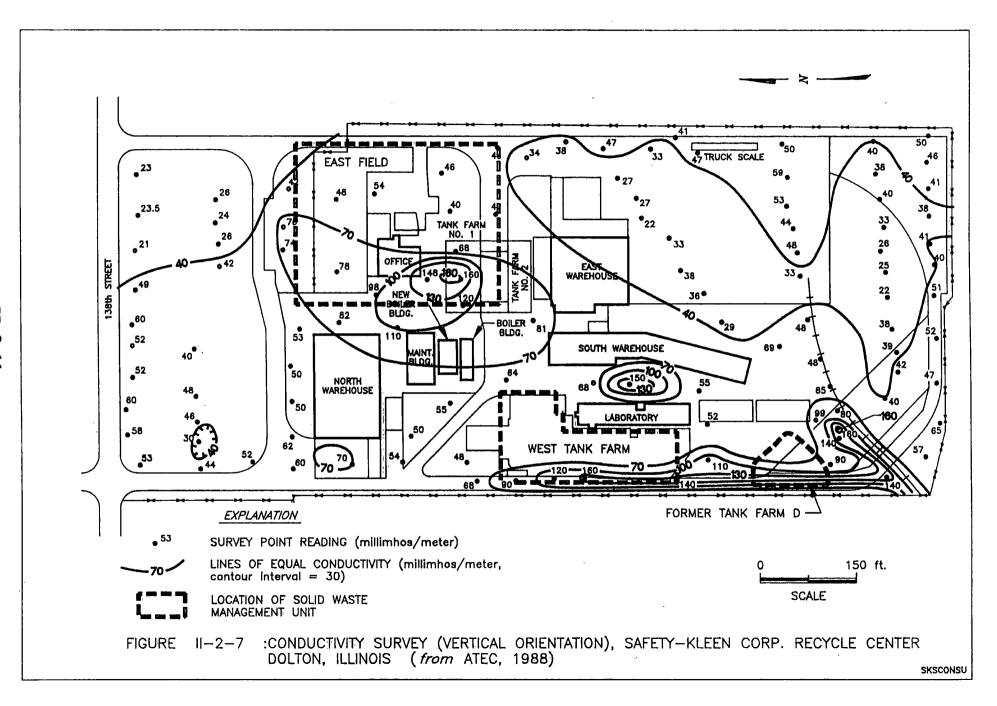
Geophysical Survey

An electromagnetic conductivity survey was conducted in 1988 at 110 locations on the plant site to identify possible areas of higher salinity or possibly buried ferrous objects. The survey did not include the Rexnord/Precision-Aire property or TriStamp/Agri-Chain lease. Surveys were performed with a 3.7 meter coil spacing using both a horizontal and vertical orientation.

The results of the survey are plotted on Figure II-2-7. The geophysical survey results correlate with the soil gas survey results. Both surveys identified the following areas of possible soil impacts and/or buried ferrous objects:

- East Field, south and west of the office building. The maximum conductivity reading [160 millimhos per meter (mm/m)] was measured in the area of 12 buried ferrous drums, which were excavated by S-K in 1991 during installation of a sewer line. Therefore, the elevated reading may reflect these buried ferrous objects rather than soil impacts. It is important to note that no other elevated readings were measured in the East Field, and therefore these results indicate no other buried ferrous objects (drums) in that area.
- West Tank Farm/Truck Station No. 9, located in the west-central part of the plant. The maximum conductivity readings (150-160 mm/m) were measured along a storm sewer that runs west of the West Tank Farm and a sanitary sewer that exits the laboratory and South Warehouse. Therefore, the elevated readings may reflect the presence of these ferrous sewers rather than soil impacts.
- Former Tank Farm D, located in the southwestern corner of the plant site. Although conductivities were slightly elevated within and east of the former tank farm (70-100 mm/m), just as in the soil gas survey, the highest conductivities (140-160 mm/m) occurred in a linear pattern along an abandoned Texas Pipeline Company pipeline easement identified in a previous report (Wang, 1990). Therefore, the elevated readings may identify this buried line rather than soil impacts.

Remaining conductivities in all other parts of the plant site were at or below background values (70 mm/m) expected for silts and clays. Background conductivities were generally lower (20-40 mm/m) in the southeastern corner where borehole logs identify an up to 15-foot thick shallow lense of silts



and fine sands, and in the northeastern corner where no borehole log information is available.

Soil Quality

Soil quality information is summarized on Figure II-2-8. Qualitative soil information is taken from the borehole logs in Appendix II-A. Quantitative data are taken from environmental investigations conducted in 1988, 1990, and 1991. The laboratory data sheets are included in Appendix II-D, and the soil quality data are summarized in Table II-2-1.

Qualitative Soil Quality Results

The qualitative results correlate with the results of the soil gas survey and geophysical survey. Four areas of soil impacts on the plant site were qualitatively described in the borehole logs:

- East Field (Boreholes 79-3, 88-1), where impacts were noted at 6.5 to 8.5 feet below ground surface in 1988. S-K excavated drums and impacted soils in this area in 1991 during installation of a sewer line. Therefore, this area has been remediated.
- West Tank Farm (Boreholes 79-2, 79-5, 79-6, 81-2, 88-2), where impacts were noted in the upper 4 feet in the south end and to 15 feet at the north end during three investigations.
- Former Tank Farms (Boreholes 83-3, 83-10, 83-12, 83-13), where impacts were noted generally to depths of 12-15 feet.
- North Warehouse Pad (Borehole 81-1), where impacts were noted to a depth of 4 feet.

Not only did the borehole logs qualitatively define where soil impacts might be, but also they defined where soil was not impacted. All the boreholes outside of the four areas mentioned above contained no mention of impacted soils. In the 12 borehole logs which mentioned impacts, all 12 logs indicated clean soils beneath the shallow intervals described above. Therefore, the qualitative descriptions provide evidence of the capability of the low permeability clay soils underlying the site to prevent vertical migration of released constituents.

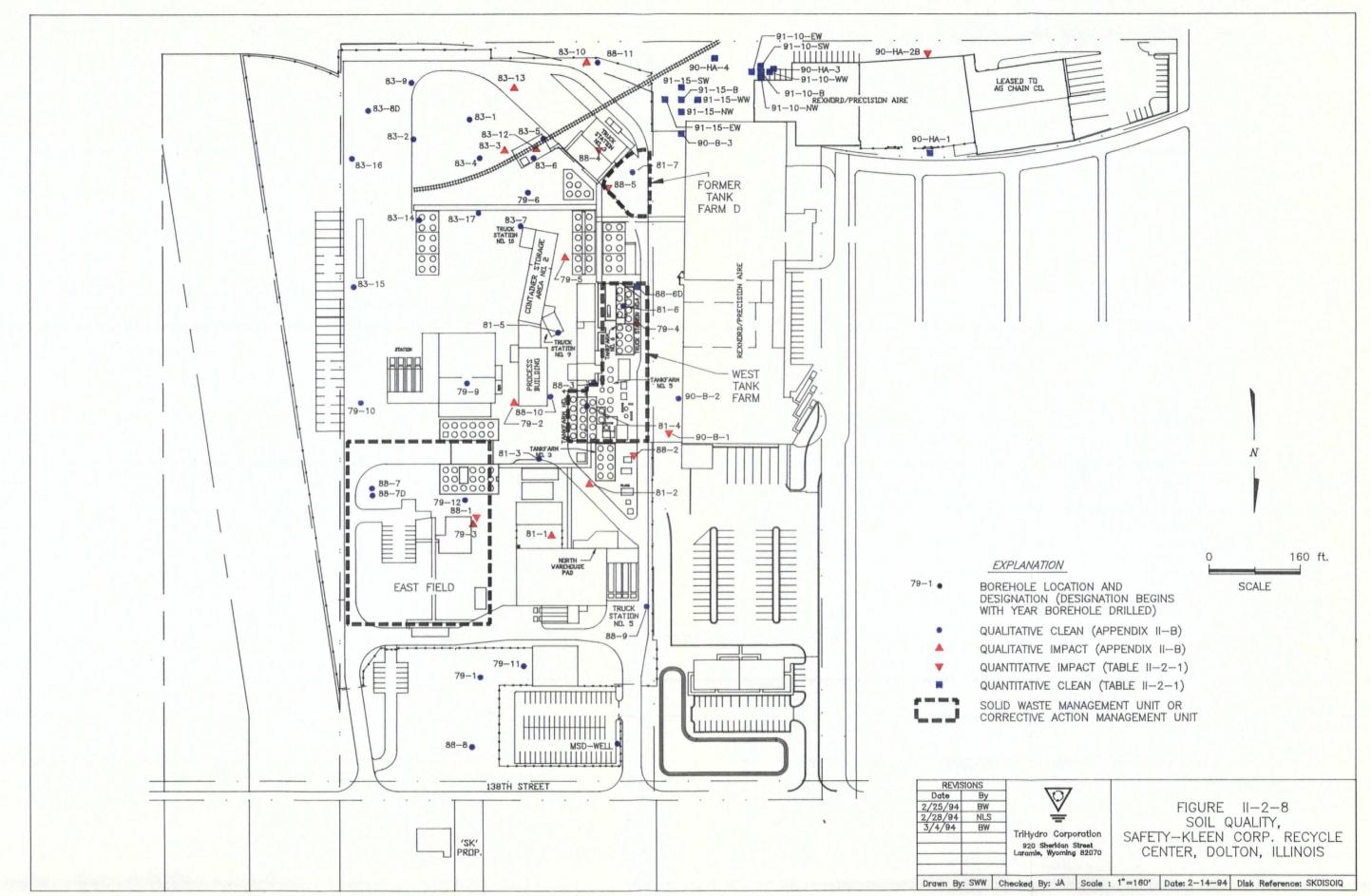


Table II-2-1. Summary of Soil Quality Data, Dolton Recycle Center, Dolton, Illinois (1988-1991).

		Volatile Organic Compounds (mg/kg)												
				Methyl	Methyl			1,1,2-			-			
				Ethyl	leobutyl	Methylene		Trichloro-	Trichloro-	Xylenes,				
Location	Acetone	Benzene	Ethylbenzene	Ketone	Ketone	Chloride	Toluene	ethane	ethene	Total	All Others			
Plant Site*														
88-1(2.5)	7.4	ND	10	6	4.2	0.26	65	0.44	ND	95	ND			
88-2(2.5)	2.2	0.41	48	1.2	9.9	ND	680	ND	5.3	1400	ND			
88-2(5)	2.5	ND	11	2.1	20	ND	110	ND	ND	28	ND			
88-2(7.5)	ND	ND	0.32	ND	ND	ND	0.43	ND	ND	1.1	ND			
88-2(10)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
88-4(2.5)	5.6	0.024	1.5	0.74	3.6	0.11	58	ND	ND	22	ND			
88-5(2.5)	1400	ND	57	1.6	12	ND	390	ND	ND	290	ND			
88-6D(2.5)	ND	ND	ND	ND	ND	ND	0.045	ND	ND	ND	ND			
Precision Aire	e Site													
90-B-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
90-B-3	ND	NĐ	ND	ND	ND	ND	ND	ND	ND	ND	ND			
90-HA-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
90-HA-2B	ND	ND	ND	ND	ND	ND	ND	ND	NĐ	ND	ND			
90-HA-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
90-HA-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
Precision Aire	site - 10,0	00-Gallon US	T Excavation											
91-10-B		ND	ND				ND			ND				
91-10-EW		ND	ND				ND			0.005				
91-10-NW	••	ND	ND				ND			ND				
91-10-SW		ND	ND				ND	••		ND				
91-10-WW		ND	ND				ND			ND				
Precision Aire	e Site - Two	16,000-Gall	on USTs Excavation	<u>on</u>										
91-15-B	••	ND	ND	••			ND			ND				
91-15-EW		ND	ND				ND			ND				
91-16-NW		ND	ND				ND			ND				
91-15-SW		ND	ND				ND			ND	••			
91-15-WW		ND	ND			••	ND			ND				

^{*} Depth below ground surface (in feet) shown in location designation.

Table II-2-1. Summary of Soil Quality Data, Dolton Recycle Center, Dolton, Illinois (1988-1991) (continued).

		_				Metals (mg	/kg)			
Location	TRPH (mg/kg)	PCB (mg/kg)	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Plant Site*										
88-1(2.5)			9	40	0.5	1.2	5.7	0.4	1	0.5
88-2(2.5)			9.3	41	0.5	1.3	9.5	0.4	1	0.5
88-4(2.5)			7.8	44	0.6	12	26	0.4	1	0.5
88-5(2.5)			8	47	0.6	1.4	13	0.4	1	0.5
88-6D(2.5)			6.7	28	0.5	7.9	3.4	0.4	1	0.5
Precision Aire	s Site									
90-B-1	270	ND	••				••	••		
90-B-3	ND	ND								
90-HA-1	ND	ND				••				
90-HA-2B	1410	ND		••			••		••	
90-HA-3	810	ND	••	••	••			**		
90-HA-4	ND	ND					••			

^{*} Depth below ground surface (in feet) shown in location designation.

Quantitative Soil Quality Results

Soil sampling and analysis was conducted at five locations (88-1, 88-2, 88-4, 88-5, 88-6) in 1988. These locations were screened as impacted during the soil gas and geophysical surveys in 1988. Samples were collected at 2.5 feet below ground surface at all locations except 88-2, where samples were collected at 2.5-foot intervals from 2.5 to 10 feet below ground surface. The results are presented in Table II-2-1, and summarized below:

- East Field (Location 88-1). Xylenes, toluene, and ethylbenzenes were measured at concentrations greater than 10 ppm. These constituents are principal components of mineral spirits. Only two chlorinated compounds were detected (1,1,2-trichloroethane at 0.4 ppm and methylene chloride at 0.25 ppm) at concentrations near the detection limit. Eight inorganic constituents were analyzed, and concentrations were at expected background levels.
- West Tank Farm (Locations 88-2 and 88-6D). Just as at the East Field, xylenes, toluene, and ethylbenzene were measured at concentrations greater than 10 ppm in samples collected to 5 feet below ground surface at Location 88-2. No other VOCs (including no chlorinated VOCs) were detected at the West Tank Farm. VOC concentrations attenuated to below detection limits at 10 feet at Location 88-2. VOC concentrations were near or below detection limits at Location 88-6D. Concentrations of inorganic constituents were at expected background levels.
- Former Tank Farm D (Locations 88-4 and 88-5). Just as at the other two SWMUs, xylenes, toluene, and ethylbenzene were measured at concentrations greater than 10 ppm. In addition, acetone and methyl isobutyl ketone (4-methyl 1,2-pentanone), which are principal components of lacquer thinner, were measured at concentrations greater than 10 ppm. Methylene chloride (0.1 ppm at 88-4) was the only chlorinated VOC detected. Concentrations of inorganic constituents were at expected background levels.

Soil sampling and analysis was also conducted at 17 locations on the Rexnord/Precision-Aire property. The results are listed in Table II-2-1, summarized on Figure II-2-8, and described below by area of concern:

• <u>Former USTs</u>. Three fuel oil USTs were located in two vaults at the southeastern corner of the build-

ing. Two samples (90-B-3 and 90-HA-3) collected in 1990 prior to remediation showed no detectable VOCs and total recoverable petroleum hydrocarbons (TRPH) concentrations of nondetectable and 810 mg/kg, respectively. After tank removal and excavation of impacted soils, concentrations of benzene, ethylbenzene, toluene, and xylenes (BETX) in ten soil samples collected from the two vault excavations were consistently below detection limits, except in one sample (91-10-EW) collected from the east wall of the 10,000-gallon fuel tank excavation, where a very low xylenes concentration (0.005 mg/kg) was below the clean closure objective.

- <u>Aboveground Tanks</u>. The two fuel oil and/or acid aboveground storage tanks were located on a concrete pad south of the building. One sample (90-HA-2B) showed no detectable VOCs and a TRPH concentration of 1410 ppm.
- <u>Abandoned Pipeline</u>. One soil sample (90-HA-4) collected from an abandoned Texas Pipeline Company pipeline easement showed no detectable VOCs or TRPH.
- West Tank Farm. One sample (90-B-1) collected on the Precision Aire site west of the West Tank Farm showed no detectable VOCs and a TRPH concentration of 270 ppm.
- <u>Loading Ramp</u>. One sample (90-HA-1) next to a loading ramp showed no detectable VOCs or TRPH.

CHAPTER II-3

GROUND-WATER CONDITIONS

Considerable information regarding ground-water conditions has been collected during previous investigations at the Dolton Recycle Center. Ground-water data have been collected at 37 locations during three previous investigations:

- 1. A 1983 environmental investigation in the southeastern part of the facility;
- 2. A 1988 due diligence environmental investigation at the plant site; and
- 3. A 1993 reconnaissance investigation to determine the status of existing wells.

During these three investigations, information has been generated in the vicinity of the solid waste management units (SWMUs) designated in the Part B Permit. The following groundwater information has been collected on the site:

- Physical descriptions of ground-water occurrence at the 37 locations.
- Permeability data on the perched water-bearing zone and underlying clay aquitard.
- Fluid level data at 27 locations in the perched water-bearing zone and three locations in the dolomite aquifer.
- Water quality data at 21 locations in the perched water-bearing zone and three locations in the dolomite aquifer.

The ground-water data collected during these investigations have led to the identification of the same three impacted areas described in the previous chapter. In addition, the data identify site-specific conditions which limit the extent of ground-water impacts and potential for migration.

Per the Part B Permit, ground water is not a medium under investigation during Phase I of the RCRA Facility Investigation (RFI). However, the ground-water data collected to date begin to satisfy the Phase II and Phase III objectives, which include the definition of the nature, degree, and extent of ground-water impacts. Because previous ground-water data are

relevant to the comprehensive RFI, they are described in detail below.

Monitoring Well Network

Thirty-eight monitoring wells have been installed at the plant site — one by the Metropolitan Sanitary District and 37 by current or past owners of the site. The existing and abandoned/damaged monitoring well locations are shown on Figure II-3-1. Monitoring well completion diagrams are included in Appendix II-E. No wells have been installed on the Rexnord/Precision Aire property west of the plant site.

Wells 1 through 17 in the southeastern part of the plant site were installed in 1983 as part of an environmental investigation in the vicinity of a former UST vault. Well 8D was completed in the dolomite aquifer, and the remaining wells were completed in the perched zone. None of these wells currently exists.

Wells SK-1 through SK-11 were installed in 1988 as part of a due diligence environmental investigation. Wells SK-6D and SK-7D were completed in the dolomite aquifer, and the remaining wells were completed in the perched zone. Six wells (SK-1, SK-2, SK-7, SK-7D, SK-8, and SK-11) currently exist. Well completion information on these six wells is summarized in Table II-3-1.

Wells 22 through 28 are located in the West Tank Farm, and were installed prior to purchase of the facility by Safety-Kleen Corp. (S-K) in 1987. The wells currently exist and are 3-inch steel pipe completed within the West Tank Farm concrete containment structure. However, no additional information is available on the dates of installation, reasons for installation, or subsurface well completion. Because of the lack of information on the wells, S-K intends to abandon them properly.

The Metropolitan Sanitary District (MSD) installed an observation well along 138th Street in 1984. The well is completed in the dolomite aquifer to a depth of 343 feet. During the 1993 reconnaissance investigation, the well was determined to be a 1-inch steel pipe that was blocked approximately 18 inches below ground surface.

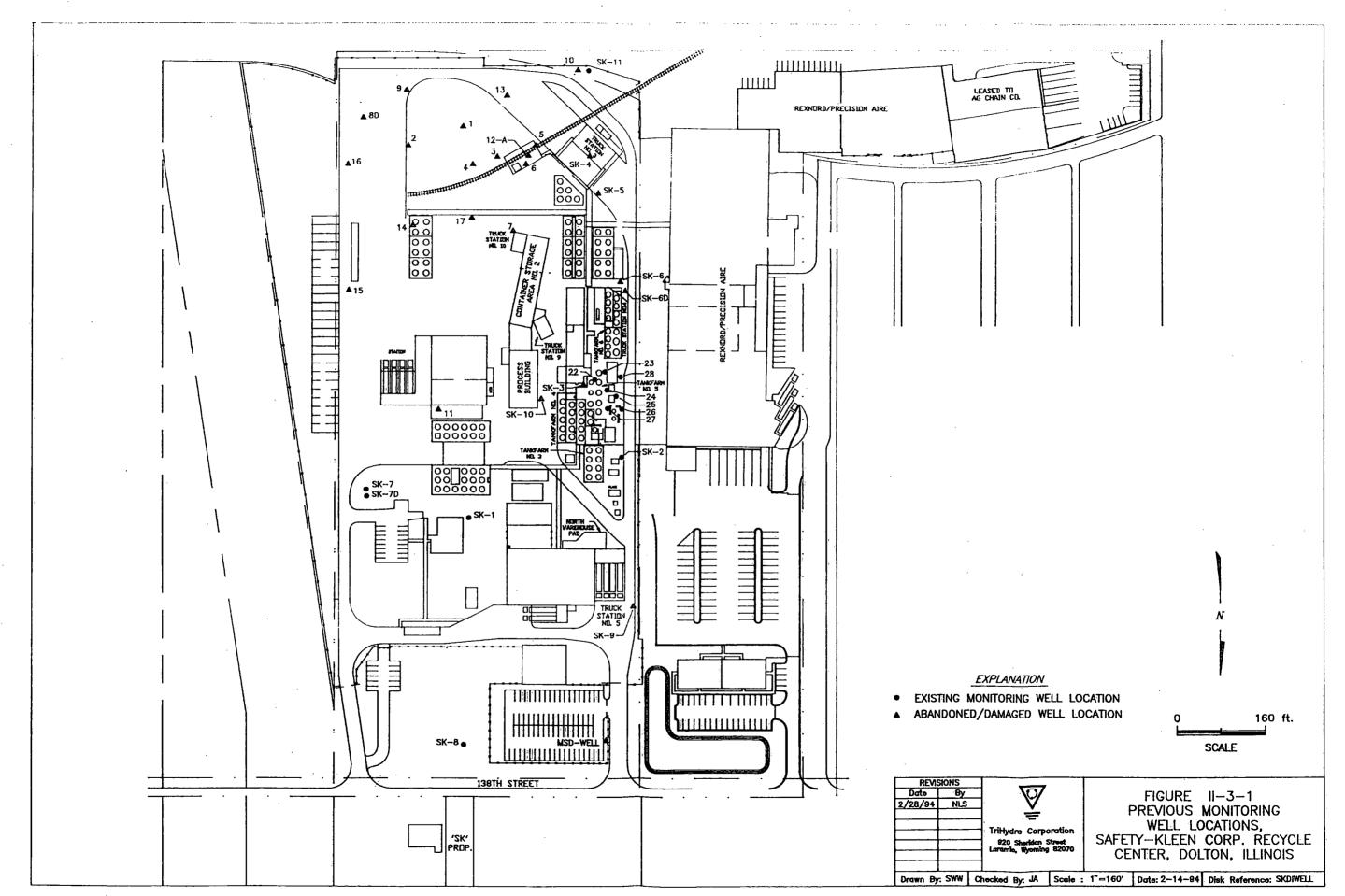


Table II-3-1. Monitoring Well Completion Data, Safety-Kleen Corp. Recycle Center, Dolton, Illinois.

Well	Measuring Point Elevation (ft-msl)	Well Construction	Stick Up (ft)	Total Depth (ft-bgs)	Screened Interval (ft-msl)
sk-1	590.93	2" stainless steel, 10-slot screen	-0.5	12	579.5-584.5
SK-2	59121	2" stainless steel, 10-slot screen	-0.3	12	579.6-584.6
SK-7	592.12	2" PVC, 10-slot screen	1.4	10.5	580.3-585.3
SK-7D	592.15	2" PVC, 10-slot screen	16	43	547.7-552.7
SK-8	590.92	2" PVC, 10-slot screen	1.7	10	579.3-584.3
SK-11	597.47	2" PVC, 10-slot screen	2.4	9	586.2-591.2

Measuring point is located on the top of the well casing.

Regional Hydrogeology

The regional hydrogeology includes two shallow, water-bearing zones: a near-surface water-bearing zone perched on low permeability clays and silts and the Niagaran Dolomite aquifer. The shallow perched zone is generally 10-20 feet thick. Because the topography in the area is flat, the flow gradients in the perched zone are small. Ground water generally flows toward the nearest surface water body; but the flow direction can be locally influenced by leaky sewers and sump pumps (ATEC, 1988).

The Niagaran Dolomite aquifer is capable of producing significant yields of potable water principally from secondary solution features; therefore, yields vary considerably over short distances. The regional flow direction in the dolomite is reported to be generally east or southeast in the direction of dip (ATEC, 1988).

Ground-Water Occurrence

The occurrence of ground water at the facility is consistent with the regional hydrogeology. A shallow perched water-bearing zone was encountered at depths of 1 to 5 feet below ground surface. The shallow zone is present where permeable materials (fill and fine sand) are present. The shallow zone reaches its maximum thickness in the southeastern part at 15 feet. The shallow zone has been absent in Well SK-8, located in the northeast corner, since the well was installed in 1988. Low permeability clay is present from ground surface to total well depth (10 feet) at SK-8.

A clay aquitard at least 30 feet thick underlies the entire facility. Samples of the clay aquitard were collected in 1988 and subjected to falling head permeability tests to determine permeabilities. The results are included in Appendix II-F. At the two locations on the east and west sides of the plant (SK-6D at 22-22 feet and SK-7D at 30 feet), permeabilities were 2.7 to 5.5x10-8 cm/sec. Based on this low permeability and thicknesses greater than 30 feet across the entire site, the clay layer serves as a effective aquitard to prevent downward migration of constituents in the perched zone to the dolomite aquifer.

Underlying the clay aquitard is the dolomite aquifer at 45 feet below ground surface. Water was encountered near the bedrock surface in the three shallow bedrock monitoring wells installed at the site (SK-6D, SK-7D, 8D). Water supply wells at and near the facility are completed considerably deeper in

bedrock; total depths of the water supply wells are a minimum of 210 feet below ground surface (Table I-3-1).

Ground-Water Flow Directions

Fluid levels have been measured in the perched water zone on three occasions - November 1983, November 1988, and September 1993. Potentiometric surface elevations and contour lines (where possible) are shown on figures II-3-2 through II-3-4. All three maps show the same pattern. Ground water in the perched zone tends to flow from the southwestern corner toward the east and west property boundaries. The perched water-bearing zone was absent in the northeastern part of the facility in 1988 and 1993. The gradient is flat through much of the facility, and thus flow rates will be low in those areas.

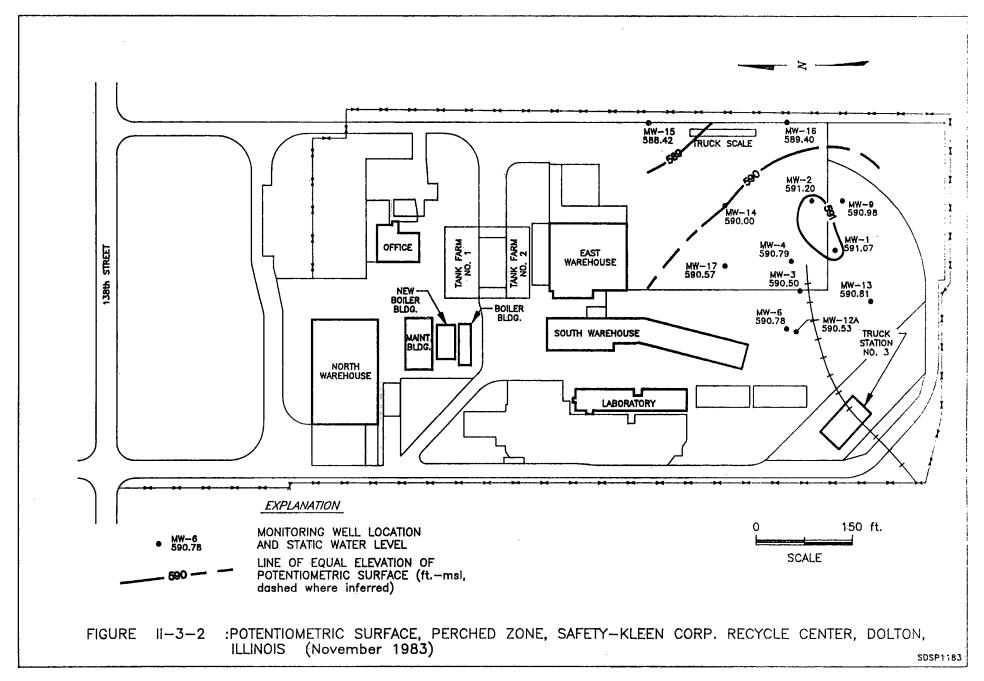
Ground-water levels are higher in the southwestern corner due to a leaky older water line which runs along the railroad tracks from the Precision Aire property to Truck Station No. 3. The rest of the facility is served by new water lines which enter the site from the north.

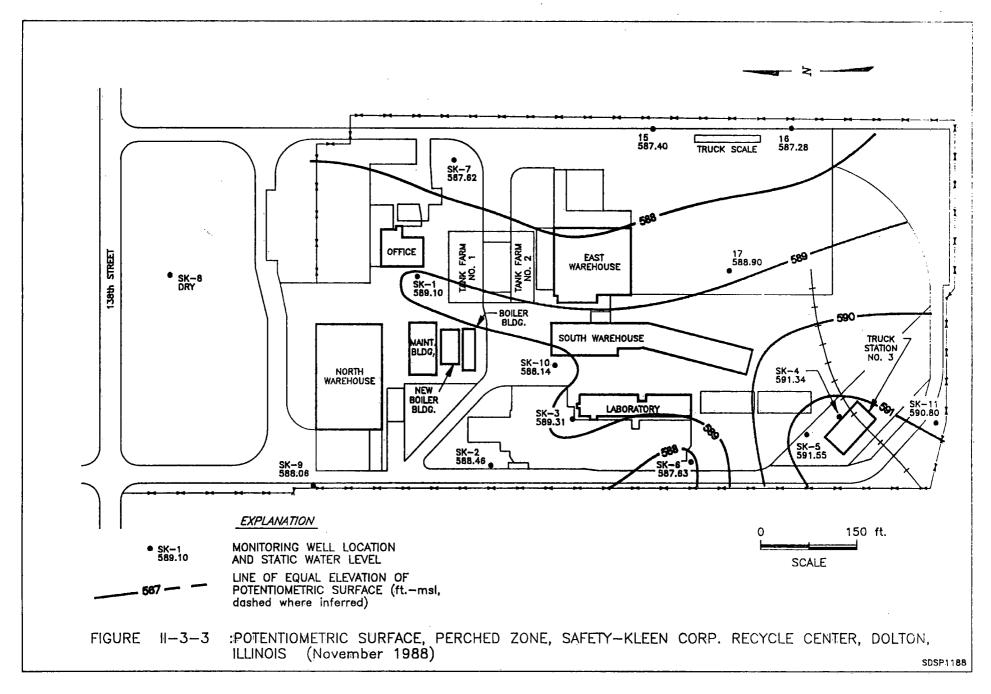
The storm sewers run north-south along the east and west sides of the plant site. Ground water was known to infiltrate the sewers up to 1989, when they were replaced by Safety-Kleen Corp., and may have contributed to the flow gradients shown on figures II-3-2 and II-3-3. The new storm sewers were inspected by the Illinois Environmental Protection Agency in 1992, and found not to be leaking. Therefore, flow gradients in the perched zone may have changed since replacement of storm sewers in 1989.

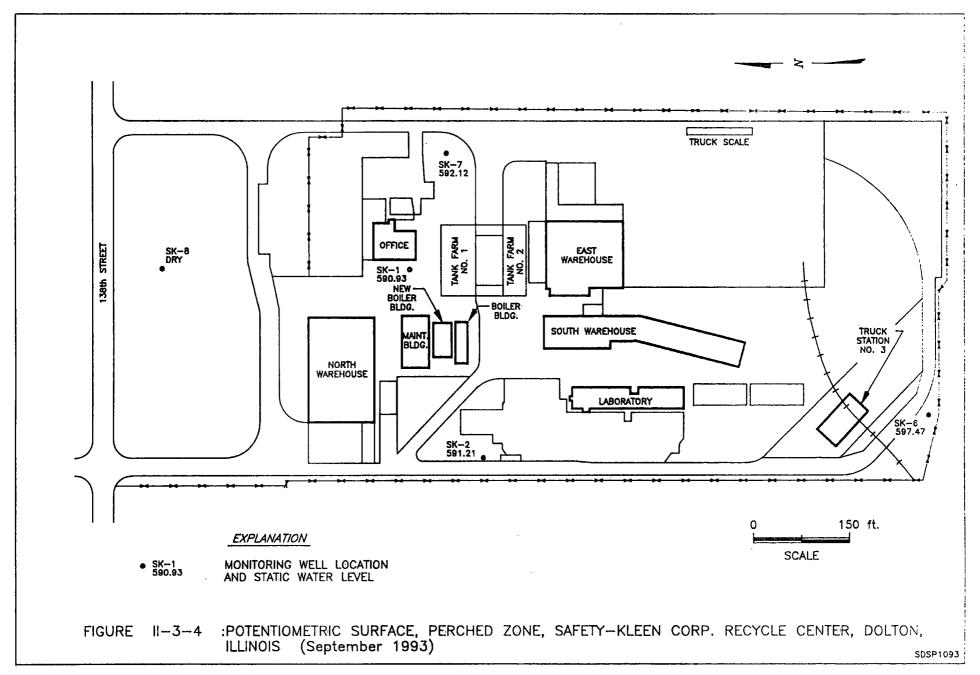
Fluid levels were measured in the three dolomite aquifer wells in November 1988. The potentiometric surface map for the dolomite aquifer is shown on Figure II-3-5. Ground-water flow is toward the southwest, based on the 1988 data. Regionally, ground water in the dolomite aquifer is reported to flow eastward toward Lake Michigan. The difference between local and regional flow directions in the bedrock aquifer may be due to local pumping of water supply wells.

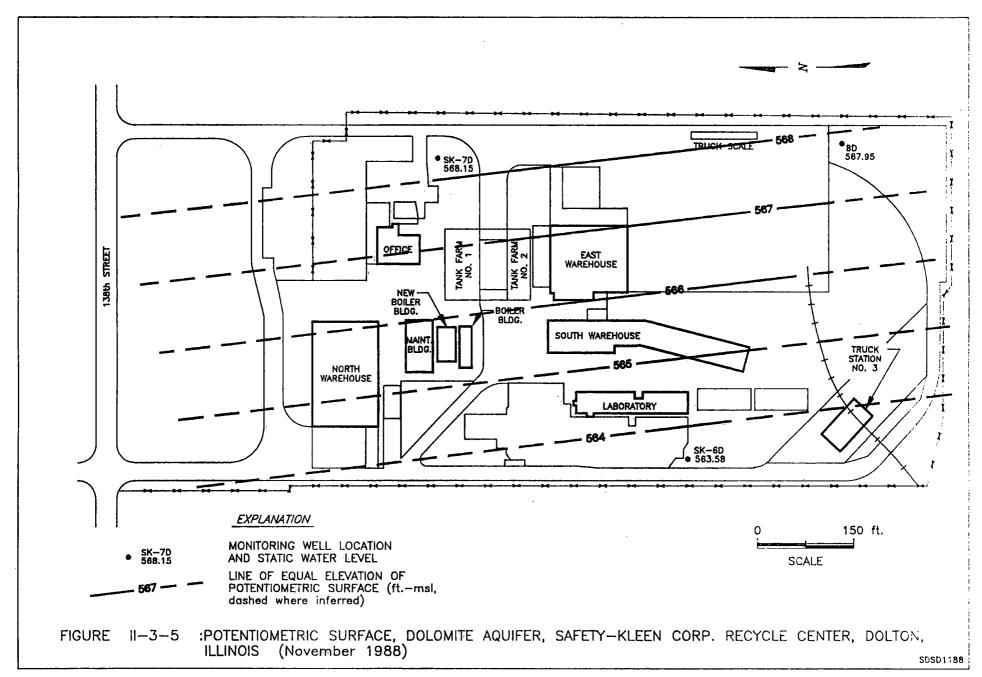
Ground-Water Quality

Ground-water quality was monitored in October-November 1983 and in October 1988. Sampling was conducted in the southeastern part of the plant in 1983, and throughout the









plant in 1988. The results are summarized in Table II-3-2 and on Figure II-3-6. Laboratory reports (where available) are included in Appendix II-G.

As shown on Figure II-3-6, ground-water quality impacts were identified in the East Field (SK-1), at the West Tank Farm (SK-2, SK-3), and east of Former Tank Farm D (SK-4, SK-5, 3, 5, 12-A). Volatile organic constituents (VOCs) and metals were not detected at the other ground-water monitoring locations.

The following VOCs exceeded Illinois Class II standards:

- Benzene in the West Tank Farm (0.055 mg/L at SK-2).
 The standard is 0.025 mg/L.
- Toluene in the West Tank Farm (8.7 mg/L at SK-2) and Former Tank Farm D (230 mg/L at SK-5). The standard is 2.5 mg/L.
- 1,1,1-Trichloroethane near Former Tank Farm D (1.2 mg/L at 12-A). The standard is 1.0 mg/L.
- Trichloroethene in the West Tank Farm (0.053 mg/L at SK-2 and 0.058 mg/L at SK-3). The standard is 0.025 mg/L.
- Tetrachloroethene in the East Field (0.059 mg/L at SK-1). The standard is 0.025 mg/L.

Metals concentrations were consistently at or below detection limits in the East Field (SK-1) and West Tank Farm (SK-2).

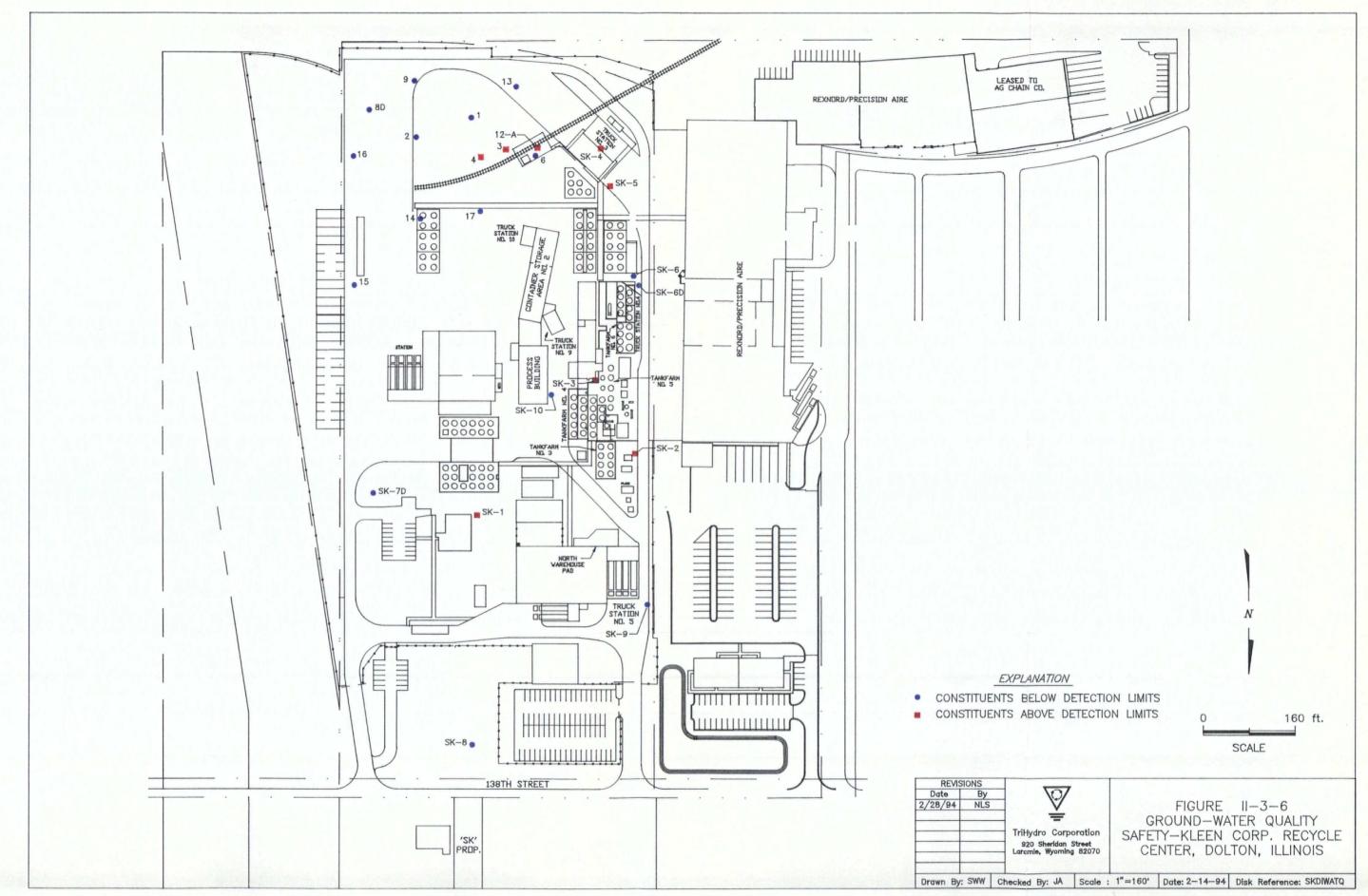
Table II-3-2. Summary of Ground-Water Quality Date, Safety-Kleen Corp. Recycle Center, Dolton, Illinois.

						4.4:			Volatile	Organic C	ompounds	(mg/L)							
					trans-1,2-	1,1-	1,1-			Methyl	Methyl				1,1,1-				
			_	Chioro-	Dichloro-	Dichloro-	Dichloro-	Ethyl-		Ethyl	Isobutyi		Tetrachloro-		Trichloro-	Trichloro-	Vinyl	Xylenes,	
Well	Date	Acetone	Benzene	ethene	ethene	ethane	ethene	benzene	2-Hexanone	Ketone	Ketone	Chloride	ethene	Toluene	ethane	ethene	Acetate	Total	All Others
SK-1	10-88	ND.	0.005	0.2	0.023	0.012	0.006	ND	ND	ND	ND	0.014	0.059	ND	0.038	0.011	0.019	0:012	ND
SK-2	10-88	15(B)	0.055	ND	ND	ND	ND	0.31	ND.	6.8	12	0.18	ND	8:7	ND	0.053	ND	1.8	ND
SK-3	10-88	3(B)	ND	ND	ND	ND	ND	ND	ND	0.82	0.37	ND	ND	0.32	ND	0.058	ND	0.054	ND
SK-4	10-88	15(B)	0.02	ND	ND	ND	ND	ND	0.018	1.4	1.8	1.6	ND	0.77	ND	ND	ND	0.81	ND
SK-5 SK-6	10-88 10-88	130(B)	ND	ND ND	ND	ND	ND	ND ND	ND ND	11 ND	64 ND	ND ND	ND	230	ND	ND	ND ND	7:3	ND
SK-6D	10-88	ND	ND ND	ND	ND	ND ND	ND ND	ND	ND	ND ND	ND	ND	ND ND	ND ND	ND ND	ND ND	ND .	ND	ND
SK-7D	10-88	ND ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND ND	ND ND
SK-9	10-88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SK-10	10-88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	10-83											••			ND				
	11-83				••	••		••	••			••	••		ND			••	
2	10-83	••			••					••			-		ND	••		••	
	11-83	••		••	••			••	••	••			••		ND	••	••	••	
3	10-83 11-83	••							••					••	0.016				
		••	••	••	••	••	••	••	••	••	••				0.018	••	••	••	••
4	10-83				••			••	••					••	0.06	••			
	11-83		••	••	••	••	••	••	••		••	••			0.04		**	••	••
6	10-83	••		••	••			••	••	••	••				0.001	**		••	
	11-83	••	••		••		••	•-	••	••	••	••	••		ND	••	••		
8D	10-83	••	••	••	••		••	••	••		••	••			ND			••	
١	11-83	••	••	••	••	••	••	••			••	•••			ND		·	••	
)	10-88	ND	ND	ND	ND	ND	ND	ND	ND:	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	10-83	••									••				ND			••	
	11-83	••								••	••				ND	••	••	••	
12A	10-83	**	••									••		••	1.2		••		
	11-83	••	144										••	••	0.79	•-			
13	10-83	••	••	••						••					ND				
	11-83	**	••		-		••					••	••	••	ND	••		••	
14	10-83	••		••	••	••			••	••	••		••		ND			••	
	11-83				••				••	**	••	•• .		**	ND		••	••	•-
16	10-83	••	••	••				••	••			••	••	••	ND	••			
	11-83	••	••	••	**		••		••				••		ND	••	••	••	
16	10-83	••	••	••	••		••	••	••			•• .	••		ND	••	••	••	
	11-83	••	••	••	••			••	••	••	••	••			ND	••	••		
								••							MD				
17	10-83 11-83						-		••			 ,	••		ND ND				

Note;
"B" means:constituent detected:in blank(s)

Table II-3-2. Summary of Ground-Water Quality Data, Safety-Kleen Corp. Recycle Center, Dolton, Illinois (continued).

						Total Met	als (mg/L)·			
Well	Date	TPH (ppb)	Arsenic	Berium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
SK-1	10-88		ND	ND	ND	ND	ND	ND	ND	ND
SK-2	10-88	-	ND	ND	0.01	ND	ND ·	ND	ND	ND
SK-3	10-88	ND	••		-		••			



CHAPTER II-4

POTENTIAL MIGRATION PATHWAYS

The primary objective of Phase I is to determine if a SWMu has released, is currently releasing, or has the potential to release hazardous waste or hazardous constituents to the soil or air. Safety-Kleen Corp. (S-K) has evaluated potential migration pathways in order to design the RFI activities to be conducted during Phase I. The results of the evaluation are provided below.

<u>Air</u>

Air emissions from the tanks and process units are regulated by the Illinois Environmental Protection Agency, Division of Air Pollution Control (DAPC). S-K has been issued a permit by DAPC that limits emissions from process units and tanks to levels protective of human health and the environment. No violations of the emissions limits in the permit have occurred under S-K operation of this facility.

Emissions from soils impacts by releases from solid waste management units (SWMUs) are not regulated by the DAPC permit. The soil gas survey and soil sampling conducted in 1988 (reference Chapter II-2) indicate volatile organic compounds (VOCs) were present in shallow soils in the East Field, West Tank Farm, and Former Tank Farm D areas. Much of the West Tank Farm and former Tank Farm D areas are covered by concrete, which will mitigate VOC emissions to air. As discussed in Part VI, S-K intends to estimate VOC emissions from soils impacted by releases from SWMUs to determine if this migration pathway is significant.

Soils

Shallow soil impacts have been identified in the East Field, West Tank Farm, and former Tank Farm D areas. Most of the impacted soils in the SWMUs are covered by concrete or structures. Therefore, the potential for ingestion of or dermal contact with impacted soils at the SWMUs is minimal. As discussed in Part IV, S-K intends to evaluate the potential for ingestion of or dermal contact with impacted soils at SWMUs during Phase I.

Surface Water

The potential for constituents to migration from the SWMUs to surface water is minimal. Stormwater in the plant is discharged to the sanitary sewer, where it is treated prior to discharge to surface waters. Stormwater at the former Rexnord/Precision Aire property and Agri-Chain lease is discharged to the detention pond in the northern part of the plant, then to the local sanitary sewer, where it is treated prior to discharge to surface water. No significant outdoor SWMUs have been identified at the Rexnord/Precision Aire property or the Agri-Chain lease. Therefore, the potential for either area to contribute significant concentrations of hazardous constituents to surface water is minimal.

Ground Water

Impacts to the shallow perched water-bearing zone have been identified in the vicinity of the designated SWMUs. There is no beneficial use of the perched water-bearing zone, and water quality data collected from the site indicate that the underlying dolomite aquifer has not been impacted. In addition, permeability tests of the clay aquiclude overlying the dolomite aquifer demonstrate the minimal potential for releases from SWMUs to impact the dolomite aquifer. S-K intends to conduct additional investigations during Phases I and II (if necessary) of the RCRA Facility Investigation to confirm the limited potential for constituents released from SWMUs to migrate to possible points of impact.

CHAPTER II-5

REFERENCES

- ATEC Associates, January 13, 1989. Report, Hydrogeologic Assessment, Safety-Kleen Facility, Dolton, Illinois.
- Eastep, Lawrence W., January 12, 1994. Letter from Illinois Environmental Protection Agency to Safety-Kleen Concerning Identification of Solid Waste Management Units under RCRA Corrective Action.
- Environmental Risk Information and Imaging Services, February 2, 1994. Federal/State Database Report and Sanborn Fire Insurance Maps.
- Groundwater Technology, Inc., February 1, 1991. Underground Storage Tank Removal, Safety-Kleen Corp. Dolton Recycle Facility, 13943 Park Avenue, Dolton, Illinois.
- Illinois Environmental Protection Agency, May 30, 1993.

 RCRA Facility Assessment, Safety-Kleen Corp. Dolton Recycle Center, Cook County, Dolton, Illinois (Part B Log #120).
- Part B Permit, Safety-Kleen Enviro Systems (ILD-980613913).
- Safety-Kleen Corp., November 1993. Environmental Information Package, Dolton Recycle Center.
- Salisbury Engineering, Inc., June 8, 1979. Soil Test Borings for Preliminary Subsurface Exploration, Barker Oil Property, Dolton, Illinois.
- _____, June 8, 1979. Additional Test Boring, Barker Oil Property, Dolton, Illinois.
- _____, November 9, 1981. Subsurface Exploration, McKesson Chemical Plant, Dolton, Illinois.
- Salisbury/Atec, 1983 (?) Partial Report (No title page) on Southeastern Part of McKesson Plant Site.
- TriHydro Corporation, October 4, 1993. Results of Well Survey, Safety-Kleen Recycle Center, Dolton, Illinois.
- Wang Engineering, Inc. January 19, 1990. Letter Report, Potential Remedial Costs, Precisionaire Property, Dolton, Illinois.

APPENDIX II-A

BOREHOLE LOGS
VICINITY OF DOLTON RECYCLE CENTER



Telephone (312) 879-646
Ground-Water Sectic
Northern Regional Offi
101 North Island Aven
Batavia, Illinois 60510-191

October 10, 1988

John McBride HTEC Associates 1501 East Main Street Griffith, Indiana 46319

Dear Mr. McBride:

Enclosed please find the data that you requested for Cook County, T36N R14E, Sections 1, 2, 3, 4, 9, 10, 11, and 12. I have also enclosed data for Cook County T37N R14E, Sections 33, 34, 35, and 36.

If you have any questions or if we can be of any further assistance, please feel free to call.

Sincerely,

Judy Mead

Assistant Supportive Scientist

OCT 1 2 1788

company Chicago Pub. Wks. Dept. No. 2

FARM Boring DATE DRILLED 1923

AUTHORITY Blue print

COLLECTOR ELEVATION 583

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Cook , ⇔² 2491 /-361-14E ILLINOIS GEOLOGICAL SURVEY, URBANA

će 1	ILLINOIS	GEOLOGICAL	SURVEY,	URBAN.
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	Thickness	Tep	Bottom
GEOLOGICAL TOFS:			
Recine fermation		71	350
Joliet formation		350	396
Romeo momber	1	350	361
Merkgraf member	1	361	396
Kenkakes formation	1	396	425
Edgewood formation	į	425	501
Brainard formation - May Top, 89'		501	515
Ft. Atkinson formation		515	554
Scales formation	!	554	671
Wise Lake formation - Gal. Top - 86		671	756
Denlieth formation	1	756	856
Guttmberg fermation		856	862
Nachusa formation		862	892
Grand Detour formation		892	935
Mifflin formation	'	935	966
Pecatenica formation		966	1000
Ansoll group - GSP Tep, -415		1000	1048
Total depth			1045
Bore hole record: 3-3/4" - 78-503' 2-7/8" - 508-1050			
Casing: $4\frac{1}{2}$ " - 9-70'			
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report on goophysical logs and stratig	ולק <u>מיל</u>	;	
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*Near intersection of Celimet R. & Ca	nunet.	Expre	deway

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ELEVATION	585					
LOCATION	C-E/2 SE	EN.				

COUNTY COOK

1 262-1/8

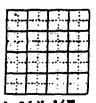
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No. 6530, LOG OF WATER WELL	: TO
Aproperty owner Calement City Industrial Deire	Wall No 729
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Permit #6530 Formations passed through	nest Bottom
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Grand.	5 74
Lange Tone	230 304
COUNTY No./DZ./.	
* Industrial Well	
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Size hole below easinginch. Static level from sur	. 2.6 .
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Length of testhrsmin. Screen	
Slot Diam Length Bottom se	
Township nameElev	Sec
Description of location NW NW NW (Permit)	1 -36N
Description of recovery	IVE
	Rge
Signed H. (decleman) County Cooks	201 145
CON Copy for Illinois State Geological Survey Index:	1-36N-14F

"LLINOT EOLOGICAL SURVEY, (SANA

engineering borings	Thickness	Tep	Bottom
B-1	}		
Fine sand, trace gravel and silt -			
light brown - loose - saturated		1	1
Very fine sand, trace to some silt-	1		
gray to medium gray - loose- wet	ł		5.0
Silty very fine sand, trace silt-	ŀ	}	ł
and decayed roots - gray - loose-	1	İ	
saturated	l	ĺ	l
Silty clay - gray-tough	1		10.0
Silty clay - gray - tough Silty clay, trace to some sand,			į.
trace gravel-gray-tough	İ	(.)	15.0
Silty and sandy clay, trace gravel		•	13.0
dark gray - hard	l		20.0
			20.0
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Logs of 9 borings filed at Warrenvil			·
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Typed by Warrenville Office	1 1	i	

COMPANY Soil Testing Services
FARM Waste Management of III., Inc. No. B-1
DATE DRILLED 12/3/73
AUTHORITY Company
ELEVATION

LOCATION SE, SW, NW COUNTY COOK



1-36 N-14E

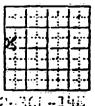
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	Triff		C	3.5
	Inrh hard line		1. 5	150
	Hard white lime		150	7.7.5
	Brown lime		205	225
	White lime		225	350
	Brown line		350	្តី 🤄
	Broken lime & shale		435	باير
	Shale		μξή	ار ال
	Hard line	1	1:50	1,5
	Shale		457	6-1
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	Lims		1035	3.503
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COLLEGIA	T.). Geiger / Co.		
FREE	Hokin /lyminem Co.	EQ.	
DATE DRILLED	•	COURTY NO.	1
AUTHORITY	S.D. Ceiper A Co.		
ELEVATION	SM SM NM		

 $\mathcal{A}(\mathcal{C})$

COUNTY



(\$\$11-50M-6-69) 10

ILLINOIS GEOLOGICAL SURVEY, UXBANA

B-1 Black sand loam Brown fine sand, some silt, loose Gray silt, thin clay layers, medium dense Gray clay, soft Gray clay trace of small gravel, tough Gray silt, clay layers, vaned, dense Gray clay, some small gravel, hard Gray clay, trace of small gravel, very tough Gray clay, silt layers, hard Gray clay, some small gravel, hard Gray clay, some small gravel, hard Gray clayey silt, some small to large gravel, hard		T₩	Detting.
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Gray clay, trace of small gravel, very tough Gray clay, silt layers, hard Gray clay, some small gravel, hard Gray clayey silt, some small to			35.0
Gray clay, silt layers, hard Gray clay, some small gravel, hard Gray clayey silt, some small to			40.0
Gray clay, some small gravel, hard Gray clayey silt, some small to	1 1		45.0
Gray clayey silt, some small to			50.0
large gravel, hard			60.0
			70.0
Logs of 16 borings filed at Warrenvi NO ENVELOPE Typed by Warrenville Office	lle		

(37329-20M-5-56)

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Botton
Summary Sample Study by G. H. Emr	ich,	0/56	
Ho samples	42		42
SILURIAN SYSTEM		l	
Niegeran series		ĺ	İ
Dolomite, silty, light gray to	1		
light buff, little brown, very		ĺ	
fine to fine	53	j	95
Dolomite, very silty, light gray]	
to buffish-gray, vary fine to		·	
fine	30	}	125
Dolomite, very ailty, light gray,	1		1
white, little buff, extra fine			
to fine,	90		215
Dolomite, slightly silty, white,	1		1
light gray, extra fine to very	1		}
fine, crystalline	30		245
Alexandrian series] 1		1
Kankakee formation (350 BINE 16:	·	ļ	ļ
/ Dolomite, silty, white, extra]	}	}
fine to very fine, crystalline	5	l	250
No sample	10		260
Dolomite, as above, little brown	ì		1
at bese	10		270
Dolomite, slightly silty, white i	d		
light gray, extra fine to very	{		
fine	70		340
Dolomite, light gray to buff,] .	}
extre fine to very fine,			
crystalline, slightly speckled			}
(black)	35		375
Dolouite, slightly cherty,			
(Aluma & Ste	e l Hi	ll Dolt	1 50 81

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	S. B. Geiger	<u> </u>	
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Page 2 ILLINOIS GEOLOGICAL SURVEY, URBANA				
Stratu	Thickness	Top	Bettern	
slightly silty, buff to buff:				
gray, very fine to fine	35		410	
No sample	5		415	
Dolomite, as above	15		430	
Edgewood formation	}		ļ	
Dolomite, very silty, gray to	•			
grayish-buff, very fine, sl:	ightly		ł	
speckled (black)	25		455	
ORDOVICIAN SYSTEM			1	
Cincinnatian series			1	
Maquoketa formation]	
Shale, white to light greenis	sh-		1	
gray, weak to brittle and		•	<u> </u>	
dolomitic, buff to light gra			ļ	
very fine	5		460	
Dolomite, light buff to buff				
extra fine to fine, crystal	line,		1	
slightly speckled	15		475	
Dolomite, light gray to gray:	ish-		i	
buff, extra fine to fine,	1 1		<u> </u>	
mottled, "calcarenite", and				
little shale, buff, weak	25		500	
Shale, slightly delomitic, gr	rayish-		•	
buff to greenish-gray, weak			l	
brittle, little tough near			i	
little dolomite, argillaceou			}	
buffish-gray, fine at top	75		575	
Shale, silty, slightly dolom				
greenish-gray to grayish-bu	ff,		i	
weak to tough	25 5 10		600	
No sample	5		605	
Shale, as above	- 1 10		615	
Mohawkian series			ļ	
Gelena formation]	
Dolomite, slightly argillace]	
buff to light grayish-buff,				
to medium, crystalline, sli				
speckled (black)	45		660	

S. B. Geiger COOK S.S. #25165

Hokin Aluminum Co. #1 2-36N-14E

COUNTY

Dolomite, trace argillaceous, grayieh-buff to buff, very fine to medium, crystalline Dolomite, slightly argillaceous, grayish-buff, fine to medium, mottled, "calcarenite" No sample Dolomite, buff to grayish-buff, very fine to medium, crystalline No sample Dolomite, buff, little beown, very fine to medium, crystalline Decorah formation Dolomite, buff, little gray, brown, fine, speckled (brown, black) Platteville formation Dolomite, slightly argillaceous, buff to grayish-buff, fine to medium, crystalline Dolomite, slightly argillaceous, gray to buffish-gray, very fine to fine, crystalline Dolomite, slightly argillaceous, buff to buffish-gray, very fine to fine, little medium, crystalline Glenwood formation Sandstone, dolomitic, light gray, buff, fine, coarse, frosted, rounded, incoherent, compact Sandstone, white to light gray, fine to coarse, frosted, rounded incoherent Sandstone, very silty, white to light gray, very fine to fine, coarse, frosted, rounded, incoherent Sandstone, very silty, white to light gray, very fine to fine, coarse, frosted, rounded, incoherent Sandstone, very silty, white to light gray, very fine to fine, coarse, frosted, rounded, incoherent	Bottom	Top	Thickness		
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buff to buffish-gray, very fine to fine, little medium, crystal line Glenwood formation Sandstone, dolomitic, light gray, buff, fine, coarse, frosted, rounded, incoherent, compact Sandstone, white to light gray, fine to coarse, frosted, rounded, incoherent Sandstone, very silty, white to light gray, very fine to fine,				tly profilerance.	To Illie,
to fine, little medium, crystal- line Since Glenwood formation Sandstone, dolomitic, light gray, buff, fine, coarse, frosted, rounded, incoherent, compact Sandstone, white to light gray, fine to coarse, frosted, rounded, incoherent Sandstone, very silty, white to light gray, very fine to fine,			. !		
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Sandstone, white to light gray, fine to coarse, frosted, rounded, incoherent Sandstone, very silty, white to light gray, very fine to fine,	94		5		
fine to coarse, frosted, rounded, incoherent Sandstone, very silty, white to light gray, very fine to fine,	, ,,,		٦	a to light gray.	Sandstone
incoherent Sandstone, very silty, white to light gray, very fine to fine,	1				
Sandstone, very silty, white to light gray, very fine to fine,	97		35	b statement tomical	
light gray, very fine to fine,	1		1	silty, white to	
	1		ĺ	ry fine to fine.	light or
CORTEGA ITUSTEGA IUMIKUEGA INCOT!					
herent 10	98		10	-, a, =	-

S. B. Geiger Hokin Aluminum Co. #1

COUNTY S.S: #25165 2-36N-14E



Strain	Tolckness	Top	Bottom
Chazy series			
St. Peter formation			
Sandstone, white to light gray,			1
very fine to medium, little	i		!
coarse, frosted, rounded, inco-			
herent	15		1000
No sample	5		1005
Sandstone, as above	15		10.20
No sample	10		1030
Sandstone, silty, white to light			
gray, fine to very coarse,			
incoherent; little shale,			
dolomite and chert	10		1040
No sample	5		1045
Prairie du Chien series			1
Oneota formation			1.
Dolomite, cherty (oolitic),	1		ļ
slightly argillaceous, white to	.!!		1
light buffish-gray, very fine to			
medium, crystalline	40		1085
Dolomite, cherty, white to buffi	sh-		1
gray, very fine to medium,			
crystalline	15		1100
Dolomite, cherty, slightly silty	•		1
buff to light buff, very fine to	0		
medium, crystalline	20		1120
Dolomite, slightly therty, slight			Į
silty, light buff to buff, litt			
pink, fine to medium, crystalling			1130
Dolomite, slightly argillaceous,			
light gray to light buff,			İ
extra fine to fine, crystalline	10		1140
Dolomite, silty, light gray to			1
pinkish-buff, very fine to			1
medium, crystalline	15		1155
Dolomite, very sandy, silty,	1		
light gray, buff to pinkish,			
extra fine to fine, crystalline	5		1160

S. B. Geiger

Hokin Aluminum Co. #1
5 2-36N-14E

Strain	Thickness	Тер	Bottom
Sandstone, white to light gray,			
fine to very coarse, incoherent,	1 1		
little compact; dolomite,			1
alightly sandy, slightly silty,			
light gray to light buff, extra	1	•	
fine to fine, crystalline	15		1175
Dolomite, slightly cherty (coliti	c) ,		
slightly argillaceous, light	! İ		1
buff to pink, very fine to fine,			
crystalline; little sandstone,	!		i
dolomitic, light gray, fine to			1
coarse, compact, little inco-	i i		İ
herent	20		1195
Dolomite, sandy, slightly silty,	! !		{
light gray, extra fine to fine,	-		
crystalline	10		1205
CAMBRIAN SYSTEM			
St. Croixan series	į į		
Trempeolean formation	!!!		
Dolomite, slightly silty, slightl	Y		!
glauconitic, light buff, very			j
fine to fine, crystalline	10		1215
Dolomite, slightly silty, light			
gray to light buff, very fine to			
medium, crystalline	30		1260
No sample	5		1265
Dolomite, white to light gray,		•	1
extra fine to medium, crystallin	e 15		1280
Dolomite, slightly silty, light			1
gray to light buff, very fine to			
medium, crystalline, no sample	į		
(1295–1300)	25		1305
Dolomite, dity, white to light			1
buff, very fine to fine, little	ĺ		
medium, crystalline, little			1
geodic quartz	30		1335
Dolomite, argillaceous, light			1
buff to grayish-buff, very fine			Į.

COUNTY S. B. Geiger S.s. #25165 Hokin Aluminum Co. #1

Page	6

Lan P	ILLINOIS GEOLOGICAL SURVEY, URBANA			
	Strata	Thickness	Top	Bottom
	to fine, crystalline, liitle			
	geodic quartz	15		1350
	Dolomite, very argillaceous,			
	light buff, very fine to medium,	<u> </u>		
	crystalline	10		1360
	Dolomite, Slightly argillaceous,			
	light buff to buff, very fine to			
	fine, trace geodic quartz	25		1385
	Dolomite, silty, sandy, glauconit	, ,		
	(fine), light buff to light gray			i
	very fine to fine, crystalline	10		1395
	Dolomite, very sandy, glauconitic	• •		10,0
	(fine), light gray to pink, very			<u> </u>
	fine to fine, crystalline	10		1405
12	ranconia formation	20		1405
•	Shale, glauconitic, sandy, light	1		1
	greenish-gray, weak	5		1410
	"Black lime"	5 5		1415
	Sandstone, glauconitic, dolomitic			1410
	silty, greenish-gray to gray,			l
	very fine to fine, little			
	medium, compact; little dolomite			1
	silty, buff to pink, very fine	•		1
	to fine, crystalline	25		1440
	Dolomite, glauconitic, sandy,	24		1440
	silty, light greenish-gray, very	. [1
	fine to medium, crystalline	30		1470
	Sandstone, dolomitic, glauconitic	- :		1470
		•		Ì
	silty, buff, gray,, pink, very			1
	fine to fine, compact; shale, glauconitic, sandy, light	1		
		15		1405
	buffish-gray, weak Dolomite, glauconitic, very sandy			1485
	silty, gray to light gray to	•		
	pink, very fine to fine,	1		
		!		ſ
	crystalline; sandstone, light	i		1
•	gray, very coarse to fine,			1
	rounded, incoherent	30		1515

S. B. Geiger COOK

Hokin Aluminum Co. #1 S.S. #25165 2-36N-2-36N-14E

COUNTY

Pass 7	ILLINOIS GEOLOGICAL SURVEY, URBANA			
	Strata	Thickness	Тор	Bottom
i Si Iror Si	andstone, glauconitic, silty, light gray, very coarse to fine, rounded, incoherent; dolomits, glauconitic, sandy, buff to pink yery fine to fine, crystalline aton formation andstone, white to light gray, fine to coarse, rounded, inco-	!		1525
` } { { Si	nerent; dolomite, sandy, buff to grayish-brown, very fine to fine grystalline andstone, as above, silty; littl dolomite, slightly sandy, buff	, 10 e		1535
1	to pink, fine to medium, crystal line	- 15		1550
] ; } Si	andstone, silty, light gray to light buff, fine to coarse, rounded, incoherent, little compact; little dolomite, sandy, ouff to fine, crystalline andstone, slightly silty, light gray, very fine to coarse, rounded, incoherent; little	35	•	1585
Si	iolomite, as above andstone, slightly silty, light gray to buff, fine to very coars	30 ••		1615
Si	rounded, incoherent andstone, very silty, light buff to light gray, very fine to coar	20		1635
s Sa	rounded, incoherent indstone, dolomitic, brown to grayish-brown, very fine to fine	14		1649
) Do	ittle medium, compact clonite, silty, sandy, brown to crownish-gray, very fine to fine	6		1655
•	crystalline	7		1662
Si	esville formation andstone, light gray, fine to coarse, rounded, incoherent			1665

S. B. Geiger Hokin Aluminum Co. #1

COUNTY COOK S.S. #25165 2-36N-14E

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ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Төр	Bettoe
Sandstone, as above, slightly silty Sandstone, slightly silty, light	25		1690
gray, very fine to medium, little coarse, incoherent Eau Claire formation	24		1714
Shale, sandy, light green to greenish-gray, tough "Hard lime" "Shale"	1 5 10		1715 1720 1730
·			

S. B. Geiger COOK

S.S. #25165

Hokin Aluminum Co.#1 2-36N-14E Town Dolton Township Phornton

Company L. Wilson Well Co. No.

Farm Dolton City No. Township Phornton

Authority H. W. Hambrecht, Supt.

Elevation 602

Collector

Cen. No SW SE SW

	Strata	Thicks	Thickness		h
No.	otrata	Feet	In.	Feet	In.
	Soil, black	1		1	2
	Quicksand, light yellow		10	7	j
	Brick clay, gray, limy	33	, ,	40	1
	Limestone pebbles, hardpan	17		57	
	Limestone, loose rock, a				1
	good deal of water, not]		1
	good, lead odor	5		60	1
	Limestone, light gray, lime	60		120	}
	Lime, light gray	30	, ,	150	
	Lime, gray	20		170	
	Lime, light gray	170		340	
	Lime, light gray and light		1		1
	brown	60	1	400	1
	Lime, grayish and brownish	40		440	1
	Lime, brownish gray, made				
	test at 446', pumped well				ł
	dry in 12 min.	6		446	1
	Clay, bluish gray, limestor	e 14	i l	460	1
	Shale, gray, limy and				
	limestone, thin, fossil-				l
	iferous	20	il	480	İ
	Shale, gray with thin		j j	200	j
	streaks of limestone	20		500	1
	Shale, dark gray, limy	40		540	1
	Shale, dark gray, limy	62		802	1
	Shale, gray and brown, lim	18		620	1
	Limestone, brownish and	05		645	i
	gray, streaks of shale	25 15		660	ı
	Limestone, light brown Limestone, white to light	10		000	ſ
	Dimegenories arrive on right				

COUNTY COOK

DRILL RECORD

INDEX NO.

ILLINOIS GEOLOGICAL SURVEY, URBANA

(12-41)

3-36M-14E

Map No.

36

H

R. 14B

John C. Moore Corporation, Rochester, N. Y. Finder and holes in leaves Patented. FORM 408993

T. S.6X

R. 148 S. S.

COMPANY L. Wilson Well Co. FARM Dolton City

SHEET

HOLÈ NO.

		Thickr		Depth	
No.	Strata	Feet	In.	Feet	ln.
	brown	25		685	•
	Limestone, light brown	15	ļ.	700	•
	Lime, light brown, with				ļ
	streaks of shale, gray	95	1	795	i :
	Limestone, white and				ļ
	brownish	10	. !	805	•
l	Limestone, brown, with		i		!
	streaks of shale, brownish	1			İ
	gray	35		840	Ì
	Limestone, light brown,		!		
	with streaks of shale, gre	T 5	j	845	j
	Limestone, light gray and	•			
	brownish	5		850	
	Limestone, gray and		}		1
	brownish	40		895	i ·
	Lime, brownish and gray	5		895	ŀ
	Lime, white and dark				
	brownish gray	5	i i	900	1
	Lime, light brown	10	[]	910	
	Limestone, light brown,				
	sandy, and shale, gray	10		850	ĺ
	Sandstone, white and brown	5	1 1	925	l
	Sandstone, white and light				1
	gray	25]	950	
	Sandstone, grayish, made		! ! : !	. 35.	
	test at 980', pumped dry				l
	in 5 min.	30	1	980	
	Sandatone, white	10	l i	880	
	Sandstone, light gray	10	ļ j	1000	ł
	Sandstone, gray	10	i l	1010	1
	Sandstone, white and				
	brownish	5	1 1	1015	}
•	Sandstone, white and cream	- -			ŀ
	colored, some water in			_	ŀ
	lower part of sandstone	21	i 1	1036	

COUNTY COOK

DRILL RECORD

INDEX NO.

(2782-20M-7-41) ILLINOIS GEOLOGICAL SURVEY, URBANA



John C. Moore Carporation, Rochester, N. Y. Binder and hales in leaves Potented. FORM 408993

HART MORE

SHEET COMPANY

No.

J. Wilson Well Co. Dolton City R. 148 S.

HOLE NO.

Depth

Feet ln. Feet In. Shale, greenish gray, with limestone, brownish 5 1041 Sandstone, greenish gray, limestone, white, shale, 20 1061 prom Gray, cherty and sandy. not limy 20 1081 Shale, gray and greenish gray, limestone, gray, shale, brown 20 1101 Limestone, white and brownish magnesian 30 1131 Limestone, light buff 30 magnesian 1161 Limestone, brownish magnesian 70 1231 Limestone, grayish and brownish magnesian and shale, gray 10 1250 Limestone, grayish magnesian 10 1260 and shale, gray Cuttings washed away 40 1300 Limestone, white and brownish, lime full water crevices 12 1312 Numerous crevices between 12001 and 13001

COUNTY COOK

S.S.# 276/8

INDEX NO.

DRILL RECORD

(2782-20M-7-41)

ILLINOIS GEOLOGICAL SURVEY, URBANA

3-36H-14E

EQUESTED AND MAIL ORIGINAL TO STATE.

SUMER HEALTH PROTECTION, 535 WEST

61. DO NO ETACH GF "GICAL/WATER
E PROPER ...LL LOCATIO..."

GEOLOGICAL AND WATER SURVEYS WELL RECORD

	GLU	ordioup i	· · · · · · · · · · · · · · · · · · ·	~	~ ~~~ .		•
10	Proper	v owner It	treseletor	Sens.	Well No	9-	0
10.	Addres	100 E	· Cree .	J- 11	icas		
			merin			102	-84
11.	Permi	No//2	5853	Date _	5-9		1
12.	Water	pom	Reck	13. Cou	oty <u>C</u>	ale	
	ed den	. to to	rmotion fi	Sec.	3.1		
14.		: Diam			36 7	~ - 4-	++-
		:ft. :			145	┋┠╌╂╌	
	•			Elev		. -	4-1-1
15.	Casing	and Liner I	Pipe	•		Ш	
010	a. (Ja.)	A Kind o	and Veight	From (Pt.)	To (Pt.)		HOW IN
	5	dale	40	0	67	SECTIO	H PLAT
~		-				SEA	AM MAD
├-							
<u> </u>	6: 11	-1: 1 -1	43/1	J	L	1	
10.	Size n	ole below co	sing: 43/4/				,
17.	Signic	sever	ft. below casi. Pumping leve	og top with		maine e	11. 4
		t ——— poni		61 <u> </u>	when he	mbing o	٠
18.			ASSED THROUG	н	THICK	HERE DI	EPTH OF
10.		7 44	. 0 / .		_	, D	OTTOM_
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			•	•		- 1	
							
						i_	
(0)	טאנדאכ	E ON SEPAR	ATE SHEET IF				_
	(11.0 X	nesim	DA	//-	-16-	84
siGi	NED 7	ALL C			TE -		
		Date Loc.	Test D P W C		_	- / ·	1 145
					3	361	1 14E



Page 1 ILLINOIS GEOLOGICAL SURVEY,	UKBA	NA	
Strata	Thickness	Тор	Bottom
Drift, clay		0	50
Gray limestone	ŀ	50	315
Gray limestone, streaks of shale	1	315	315 318
Gray limestone		318	440
Shale		440	454
Limestone		454	
Shale	İ	486	604
Brown limestone	·	604	923
Sandstone (St. Leter-very hard)	į	929	1028
Gray lime, few streaks shale to			
10561		1028	1207
Grey limestone - crevices at 121	∳¹		_
(at 1239' static water level 2	75')	1207	1275
Limestone		1275	
Green shale		1376	1200
Soft sandy lime		1377	1
Hard lime		1392	1403
Green shale		1403	1409
Shaley limestone		1409	1445
Broken lime & shale streaks		1445	1475
Limestone		1475	1515
Sä ndsto ne - Galesville		1515	1701
Limestone		1701	1704
•			TD
Tumping test - Measurements from	arcu	ed less	a] •
Callons :er minute: 178	ETU	Tid Tea	27.
Callons per minute: 178 Static: 330			
Frawdown: 18			
Pumping level: 348			
Tested well at 1207 not enough		to 54	h 7
rested well at 120% Mot enough	wer cer	66 11	4.4
company Layne-Western Co.			
Delton Realty Corp. No.	l	1-4-4-4	†•• ••••••

Delton Realty Cor Ceptember 1954 Lupne-Western Cc. FARM DATE DRILLED AUTHORITY ELEVATION 1266'N line, 200'E line of section 3-368 LOCATION COUNTY

3-3(1-)

		Page 1 ILLINOIS GEOLOGICAL SURVEY,	URBAN	łA	
			Thickness	Top	Bettern
		GEOLOGICAL TOFS:			[
	(Carbendo.	Racine formation		35	305
	\ -	Wantesha formation		305	323
17 .	/ -	Joliet fermation		323	341
Neaso	5 -	Kankahoo formation		341	377
	13	Eggerood formation	<u> </u>	377	437
Magnague	\$ 54	Ft. Athinson Committen - May. Top, 153	li	433	420
magaz y z		_Socies formation		425	550
		Wise Lets formation - Cal. Tag 21	[]	590	660
Carbonates	Galena del plattebille	Wise Leks formation - Cal. 7.0, 2's Dumlisth formation		660	771
(2,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Z Z	_ Guttenberg formation] [771	780
	. Del (Nachura formation		780	£15
	plattibille &	Nachura formation Grand Detour formation	l	815	£57
	(Mifflin formation	1 1	851	E37
	'	> Pecatonica formation	1 1	827	520
- 0	Cleaned-54 Peter	Ancell Group - 630 Tag - 325		920	937
		Total depth			\$37
		Boro Eelo Rodord: 127 - 45-507 87 597-933		,	 - -
		Casing: 127 Surface - 451 67 Surface - 5971			
		S.S. #55130			1
		Petailed report filed including interpr	1+++		i
	•	report on geophysical legs and stratig		•4.	
		summy.	7		1
		Nuclear log filed Velocity log fil	4		
		Caliper leg filed 3-Dimensional Ve	2009+	707 51	100
ø		The second secon		1	T
	•				
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	· · · · · · · · · · · · · · · · · · ·		
FARII		e 511-7	
DATE DRILLED	January 13. 1983 County in		
AUTHORITY	Pirdual Piv.		
ELEVATION	570 C.L Corpora		
LOCATION	Arten. ID ID SH	•	<u> </u>
COURTY	Cons		0_257_1/3

		<u>₹</u>
		•
	GEOLOGICAL AND WATER SURVEYS	
		WELL RECORD CAT
	10. Proper owner Vil co of South Halla	• •
	Address South Holland, Illinois	
r	Driller Wehling Well Works, Licens	
		8-27-7/1
•	12. Water from 13. Cou	mty <u>Cook</u>
	at depth toft. Sec.	9_
	14. Screen: Dicon. 12_in. Twr	p. 3611
		. <u>11.E</u>
		v. ——— — — — — — — — —
	15. Casing and Liner Pipe	الماسلسة ومستنخ
	Diam. (in.) Kind and Weight From (Ft.)	LOCK HON IN
•	12 black pipe 0	SECTION PLAT
	cemented in	2000' SL, 3 EL, SE (per
		, 51 (per
		I TO THE PERSON OF THE OF
	18. FORMATIONS PASSED THROUGH	THICKNESS DEPTH OF BOTTOM
	10:	
	_drift	0 1,9
	10:	
	_drift	0 1,9
	drift. lime	0 J19 J10 J185
	_drift	0 1,9 1,0 1,85 Διοκικ CAT-
	drift. lime Let the for This political Ments. (CONTINUE ON SEPARATE SHEET IF NECESSAR)	0 119 110 1185 Dioxice CAT-
	Just the for Theoretics wents.	1.9 1.85 1.0 1.85 1.0 1.85 1.0 1.85
	drift. lime Jul Ma for Tular politics Level. (CONTINUE ON SEPARATE SHEET IF NECESSAR) SIGNED "ehling Well "ordes, Inc. D/	0 119 110 1185 Dioxice CAT-
	drift. lime Let the for Theoretical Ments. (CONTINUE ON SEPARATE SHEET IF NECESSAR) SIGNED Webling Well Works, Inc., Di A colonel 11. Webling	0 1,9 1,0 1,85 1,0 1,85 1,0 1,85 ATE 1-27-75 SS# 59491
	drift. lime Let the for Theoretical Ments. (CONTINUE ON SEPARATE SHEET IF NECESSAR) SIGNED Webling Well Works, Inc., Di A colonel 11. Webling	1.9 1.85 1.0 1.85 1.0 1.85 1.0 1.85
	drift. lime Let the for Theoretical Ments. (CONTINUE ON SEPARATE SHEET IF NECESSAR) SIGNED Webling Well Works, Inc., Di A colonel 11. Webling	0 1,9 1,0 1,85 1,0 1,85 1,0 1,85 ATE 1-27-75 SS# 59491
	drift. lime Let the for Theoretical Ments. (CONTINUE ON SEPARATE SHEET IF NECESSAR) SIGNED Webling Well Works, Inc., Di A colonel 11. Webling	0 1,9 1,0 1,85 1,0 1,85 1,0 1,85 ATE 1-27-75 SS# 59491
	drift. lime Let the for Theoretical Ments. (CONTINUE ON SEPARATE SHEET IF NECESSAR) SIGNED Webling Well Works, Inc., Di A colonel 11. Webling	0 1,9 1,0 1,85 1,0 1,85 1,0 1,85 ATE 1-27-75 SS# 59491

TOG OF MATER METE		
Property owner arthur Melson	_Well N	<u>.70</u>
Drilled by H. Hallenan	Year_	967
Formations passed through	Thick- ness	Depth of Bottom
-Sail	1	
Velleur Class	14	15
The Can	125	38
Grand 22	2	40
Simistoni 53100	148	138
process of the second of the second of		
(b) 15.7/le		
Permit # 3574		
Receivec 11-27-68		•
Finished in limitation at 40 Cased with 5 inch galer casing from 0		38 m
andinchfrom	to	ft.
Size hole below casinginch. Static level from sur	_{rt.3}	<u>.3</u>
Tested capacity 1 C gal. per min. Temperate	17e	
Water lowered to 75 ft in in .)rs	min.
Length of test hrs. min. Screen		
Slot Diam Length Bottom s		
Township name Elev		9
Description of location_Block_11_Calumet State Sibley Addn, Subdivn. of SE/4 (Permit)	T	wp. 36 h/
Signed H. Holleman County Cook		
Copy for Illinois State Geological Survey Index:	0-36N	-74E

Bremen

	MPANY TROS. Kramer & Sons No.	le τ.		R.	148	Stc
	an Scott, Wm. & Joan Crosbi	 36				9
	EVATION 5 78 T.M.	R		\sqcap		
	LLECTOR		<u> </u>			
Col	NFIDENTIAL DATE DRILLED FOD.	. 19 4 0		\top		
	1190' S. line 14-00' W. line) THICKNI		==	==	
No.	STRAYA	FEET	1 1 m.		DEPTH	Ĭ is
	Lot 5. South 77* in De Reut Subdivision					
•	Clay, yellow Clay, blue Shell rock Gravel, dirty and water Limestone, solid	14 11 2 1 74			14 25 27 28 102	Õ
÷	Pipe set et 31° with drive end. Dry hole to 77° where water was encountered for well tested at 500 gal. per water level dropping from it meintained the rate of during a testing period when hour.	suffi drill r hou 14° t 5 gal	oier ing r, o 90	r m	ds. her	e
	S. line of lot 1191' N. of line W. line of lot is W. line of E	of Se Va ot	c. 5w	1/4		

Cook COUNTY

DRILL RECORD

(A6572-15M-10-39)

ILLINOIS GEOLOGICAL SURVEY, URBANA

INDEX NO. 2409 NA 9-36N-14E

MAP No. 25

LOG OF WATER WELL		
Property owner Cail Bailey	Well No	16
Drilled by H. Jalleman	Year	1967
Formations passed through	Thick- ness	Depth of Bottom
Sail Permit # 2714	1	
yellow- Clay	1.5	16
Blue Clay	12	28
Youvel	1	29
Linestone)	115	144
		<u> </u>
CUUNIY NO. 546		·
Received 9-22-67		
Finished in Limitations at 29		14/12
Cased with 5 inch galer. Chairy from 0	io	2 7 12
and inch from	lo	1t,
Size hole below casinginch. Static level from sur	1] /
Tested capacitygal. per min. Temperatu	re	:F.
Water lowered to 1 1 ft in. in / h	rs	min.
Length of test hrs min. Screen		
Slot Diam Length Bottom so [Show location in Sec		
Township name Elev Elev		·
Description of location P.NW SE SW (Permit)	Ţ	WD.36N
	$\frac{1}{R}$	ge 14E
Signed H. Hollaman County Coak	بين	
	-3- :-:	

S, STATE OFFICE BUILDING, SPRINGFIELD, AL / WATER SURVEYS SECTION. BE SURE TO

GEOLOGICAL AND WATER S	BRVEYS	WELL	ECOF	ָּלַעַ פֿעַ
Andrew Draus	~ 4	eted 9	1 :	29.
10. Property owner Claracter	Liveria	Well No	. <u>/)</u>	0 >61
Driller 37 Jeisen	Licens	· No	4/5	<u></u>
11. Permit No. 5/35		<u> </u>	منوز	756.4
12. Water from Liminations?	13. Cou		دسام)
at depth 65 to 173 ft.	Sec.	9		
14. Screen: Diamin.	-	. <u>36</u> N		- - -
Length:ft. Slot	Rge		.	
	Ēlev	·		-
15. Casing and Liner Pipe			. L	<u> </u>
Diam. (in.) Kind and Weight	From (Ft.)	To (F1.)		SHOW ATION IN
5 STRAGET STEEL	<u>i</u>	59	Lot	
Galv. 0102 1516			-	(Permit)
020 + 7				, = 55 = 5,
16. Size Hole below casing: 5	_in.			
17. Static level 3 1 ft. below casis				
above ground level. Pumping leve	el <u>167</u> ft.	when pu	mping	at <u> 2</u>
gpm for hours.				
_				
18. FORMATIONS PASSED THROUGH	н	тніск	NESS	DEPTH OF BOTTOM
18. FORMATIONS PASSED THROUGH	Н	ТНІСК	NESS	DEPTH OF BOTTOM
18. FORMATIONS PASSED THROUGH	н	ТНІСИ	(NESS	DEPTH OF BOTTOM
18. FORMATIONS PASSED THROUGH	H	THICK	1	DEPTH OF BOTTOM
18. FORMATIONS PASSED THROUGH	H	THICK	1	DEPTH OF BOTTOM
18. FORMATIONS PASSED THROUGH	H	THICH	1	DEPTH OF BOTTOM
18. FORMATIONS PASSED THROUGH	H	THICK	1	DEPTHOF BOTTOM 19 59 65 198
18. FORMATIONS PASSED THROUGH	H	THICH	1	DEPTH OF BOTTOM IS SY 65 198
18. FORMATIONS PASSED THROUGH	R	THICK	1	DEPTHOF BOTTOM 19 59 65 198
18. FORMATIONS PASSED THROUGH	R	THICK	1	DEPTHOF BOTTOM IS S9 65 198
18. FORMATIONS PASSED THROUGH	R	THICK	1	DEPTH OF BOTTOM IS ST 65 198
18. FORMATIONS PASSED THROUGH	R	THICK	1	DEPTHOF BOTTOM IS S9 65 198
18. FORMATIONS PASSED THROUGH			1	DEPTH OF BOTTOM IS IS IS IS IS IS IS IS IS I
Jelleni-Clay Bird Clay Sind of Grand Timestime (CONTINUE ON SEPARATE SHEET IF	NECESSARY		\$\\ \chi_6\\ \chi_3\chi_3\\ \chi\\ \c	15 59 65 198
CONTINUE ON SEPARATE SHEET IF	NECESSARY DA		\$\\ \chi_6\\ \chi_3\chi_3\\ \chi\\ \c	15 15 59 65 198 .11,1969
CONTINUE ON SEPARATE SHEET IF	NECESSARY DA		\$\\ \chi_6\\ \chi_3\chi_3\\ \chi\\ \c	15 59 65 198
Jelleni-Clay Bird Clay Sind of Grand Timestime (CONTINUE ON SEPARATE SHEET IF	NECESSARY DA		1 (s) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d	15 59 65 198

Company Claude B. Kramer 14R Van Santen Estate No. т. Sec. Authority Claude E. Kramer 36 10 X Elevation 598 top. map Collector Date Drilled 1940 Confidential 1750' N. line, 1200' W. line Thickness Strata No. Feet Feet In. 149th St. & C. & B. I. R. Clay 40 40 Sand 3 43 Rock 7 52 55 107 Rock, solid Cased with 42" to 52" Water level from surface 25' Capacity tested to 7 gallons Water lowered to 3' in 3 hrs. Total length to test run 3 hrs.

Township Thornton

COUNTY COOK

Town South Rolland

INDEX NO. 2410

10-36N-14E

Map No. 24

(A32187—20M)

ILLINOIS GEOLOGICAL SURVEY, URBANA

(10-40)

Town South Holland Township Thornton Map No. 24 Company Claude E. Kramer Farm Van Drumen, Peter Authority Claude E. Kramer R. 148 No. т. **36**N No. Sec. 10 Elevation 598 top. map SH NW Collector 1941 SW Date Drilled Confidential SW SW NW SW

	Strata	Thick	ness	Depth	
	Strata	Feet	In.	Feet	In.
	149th St. and Indiana Ave. Lot 2, Schack's Div. of Lo School Trustees Subd.				
(Soil Clay, yellow Clay, blue Gravel Rock	3 12 30 3 52		3 15 45 48	
	Mater level from surface l Capacity 10 g.p.m. Total length to test run l Bailer tested			•	

COUNTY COOK

DRILL RECORD

INDEX NO. 2410

(A32187-20M)

10-36 W-

(8511-50M-6-69) 14-

Page 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Page 1				
	ENGINEERING BORING	Thickness	Top	Betters
	MINISTER AND AND AND AND AND AND AND AND AND AND			
		[
	TOPSOIL: Soft black organic SILTY			
	CLAY, moist			3.0
	GLACIAL-LACUSTRINE: fime brown			
	fine SAND, damp			6.0
	Dense gray fine SAND, wet	Į ·		13.0
	Soft gray CLAY, organic, very mois	5 L		17.0
	Loose to firm gray SILTY, wet			27.0
	Tough gray CLAY, laminated, moist			
	till;	!		33.0
	Very tough gray SILTY CLAY, trace	į.		/7.0
	of sand & gravel, moist	ļ		47.0
		İ		
		1		
		1		İ
		!		·
		į	!	
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		i .		
		!		
			Í	
Type	ed by Warrenville	į		
	*Metropolitan Sanitary Dist. of G			
	Soils report w/30 borings filed a NO ENVELOPE	t NE I	ll. Offi	ce

COMPANY	Testing	Services Corp.						_
CUMPART						•	T -	Γ
FARM	*Calumet	Sewer 17E	wg?'	9 + 59	-		,	Į.
DATE DRILLED			COUNTY NO.					Ţ.
AUTHORITY	Company							r
ELEVATION	606.5					-		Ė.
LOCATION	NW-SE-SV	1						ŀ
COURTY	CCOK				12-	36:	-1/	ı

IND-8 Loose brn silty clay FILL, tr org. & roots Hard brn & gry silty CLAY, tr sand Hard gry silty CLAY, tr sand & pebb		11.0
& roots Hard brn & gry silty CLAY, rr sand Hard gry silty CLAY, tr sand & pebb		3.5
Hard brn & gry silty CLAY, rr sand Hard gry silty CLAY, tr sand & pebb		11.0
Hard gry silty CLAY, tr sand & pebb		1
, , , , , , , , , , , , , , , , , , , ,	!	1
Daniel Carlot		22.5
Dense gry clayey SILT	: 1	24.0
Hard gry sandy silty CLAY, occ shale		
peb	1 }	33.0
Very tough gry silty CLAY	, ;	36.0
Med gry med to coarse SAND, occ grav	'	43.0
Very dense gry SILT, occ sand & grav	· :	46.C
Very dense gry sandy GRAVEL, occ L.S.	, !	
frags	i	52.0
Very dense gry clayey SILT, occ L.S.	•	
fragments	,	
_		
•	. !	

Typed by Warrenville

Logs of 4 borings filed at NE Ill. Office City of Chgo. Dept. of Pub. Wks. Bur. of Eng. NO ENVELOPE

COMPANY	City of Chgo. Dept.	of Pub. Wks.	
FARM	Indiana Ave. Bridge	NO.IND-8	1 1
DATE DRILLED	7/66	COUNTY NO. 26558	1
AUTHORITY	Company		1:13
ELEVATION	587.5' G.L. NE. 55 ST	3:	
LOCATION	NE, De, SE		

4 REQUESTED AND MAIL ORIGINAL TO STATE CONSUMER HEALTH PROTECTION, 535 WEST 62761. DO T DETACH CLOGICAL/WATER TOE PROPER WELL LOCALION.

PROPE.	rell Loca . 10H.				
GEO	DLOGICAL AND WATER	SURVEYS	WELL F	ECO	RD .
•	mate 11-	4. Can	<u></u>	1	- る
10. Prope	rty owner Control		Agell No		
	Bul Knieron				50
Drille 11 Posmi	it No. 112587	Licen	5-2		94
12. Water	trom Rick	13. Cou		 	£/
	1 4100000	Sec	9.2		
	pthtoft. n: Diconin.		37 2	;°}—	
	ib:ft. Slot		THE		
		Ele		.	
15. Casin	g and Liner Pipe			Ŀ	
Diem. (in.)	Kind and Veight	From (Ft.)	To (FL)		SHOW CATION IN
14"	Black	0	39	BECT	tion plat SE SE
					-4 35
		•			
	<u> </u>				
16. Size I	Hole below casing: /a 3/	in.			
17. Static	Hole below casing: <u>/3 //</u> : levelft. below ca	ing top whi	ch is		ft.
17. Static	: levelft. below car ground level. Pumping le	ing top whi	ch is	mplag	ft.
17. Static	: levelft. below car	ing top whi	ch is	mplag	<u>ft.</u>
17. Static	: levelft. below car ground level. Pumping le	vel <u>330</u> ft	when pu	impleq in zas	g al
17. Static	ground level. Pumping le or hours.	vel <u>330</u> ft	when pu	e l qui	g at
17. Static	r levelft. below car r ground level. Pumping le or hours.	vel <u>330</u> ft	when pu	e l qui	g at
17. Static	ground level. Pumping le or hours.	vel <u>330</u> ft	when pu	e l qui	g at
17. Static	ground level. Pumping le or hours.	vel <u>330</u> ft	when pu	e l qui	g at
17. Static	ground level. Pumping le or hours.	vel <u>330</u> ft	when pu	e l qui	g at
17. Static	ground level. Pumping le or hours.	vel <u>330</u> ft	when pu	e l qui	g at
17. Static	ground level. Pumping le or hours.	vel <u>330</u> ft	when pu	e l qui	g at
17. Static	ground level. Pumping le or hours.	vel <u>330</u> ft	when pu	e l qui	g at
17. Static	ground level. Pumping le or hours.	vel <u>330</u> ft	when pu	e l qui	g at
17. Static	ground level. Pumping le or hours.	vel <u>330</u> ft	when pu	e l qui	g at
17. Static	ground level. Pumping le or hours.	vel <u>330</u> ft	when pu	e l qui	g at
17. Static above gpm for 18.	rievelft. below can ground level. Pumping le or hours. FORMATIONS PASSED THROUGH OF Clay	ring top white vel 330 it	THICK	e l qui	g at
17. Static above gpm for 18.	rievel	ring top white vel 330 it	THICK	HEBS	DEPTH OF BOTTOM 39 330
17. Static above gpm for 18.	rievelft. below can ground level. Pumping le or hours. FORMATIONS PASSED THROUGH OF Clay	r NECESSAR)	THICK	HEBS	DEPTH OF BOTTOM 39 330
17. Static above gpm for 18.	Jevel	r NECESSAR)	THICK	MEBS ///	g at

EQUESTED AND MAIL ORIGINAL TO STATE SUMER HEALTH PROTECTION, 535 WEST 51. DO NO' ETACH GE' 'GICAL/WATER : PROPER LLL LOCATIO...

PK	JPEK N.	-در در	CATIC	• ••						
	GEO	LOGIC	CAL A	ND WAT	ER S	URVEYS	WELL F	RECO	RD	
			Ma	1.1.	1+	£ C.			8-0	
10.	Proper	ly own	er	MAKE	114	x/ Son	Well No		1-0	<u>:-</u>
	Addres	· 457	O E	· Were	دے	F CL	icag	10 2	D//	_
4.					<u> </u>	Licen				_
	Permit			77	•	Date _ 13. Cou		<u> </u>		_
12.	Water	TOH	Fon	melion						_
			_·10		•		<i>33:</i>	ᢞ᠘		
14.	Screen						. 37	• L_		
	Length	:	_h. Si	lot			. IYE	- [
	~ .			•		Ele	v	-		_
	Casing		iner P	ipe		·		、└		-
Di	m. (la.)		Kind on	d Wolght		From (Ft.)	To (PL)		CATION	IN
14	F411	2	deh	_ 40		0_	74		TION PI SW Ni	_
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		. 121		ASSED THE	20116		Truci	CHESS	INTETE	_
18.		UNANI	10/13 /	WASED IVE	-27				BOTTO	×
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	-				7			1/	725	<u>~</u>
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:ici	VED (19	Knie	14	7 na	TF 1/-	-16 -	-84	

Data Loc. Test D P W C

33 37N 14E

EQUESTED AND MAIL ORIGINAL TO STATE
ISUMER HEALTH PROTECTION, 535 WEST
'61. DO NO 'ETACH GI 'DGICAL/WATER
E PROPER WELL LOCATION.

GEOLOGICAL AND WATER	SURVEYS	WELL F	RECO	RD
10. Property owner Metradulat				7-0
10. Property owner Illigation	W DEN	وNo الولاز	·	
Address for C. Cree				
Driller Fail Kniesim	Licens	e No	<u> </u>	22/
11. Permit No	Date _ 13. Cod			2
12. Water from Personal Person		•	. ===	
at depth toft.		33	<u>مر</u>	
14. Screen: Dicmin.		377	: L	
Length:ft. Slot	-	. IYE		
15. Carlos and I loss Dina	Elev	/. ——		
15. Casing and Liner Pipe	•		, L .	
Dism. (in.) Eind and Veight	From (FL.)	To (Pt.)		SHOW CATION IN
5" Seh 40	0	74		NE NU
				muzi-
			wee.	INT
16. Size Hole below casing: 43/4	ja.			•
17. Static levelft. below cas	ing top which	:h is		ft.
above ground level. Pumping lev	vel ft.	when bu	mpin	of
	• • • • • • • • • • • • • • • • • • • •	mate P-		,
gpm forbours.		watz p		,
		тніся		
gpm for bours.				DEPTH OF BOTTOM
gpm for bours.				
gpm for bours.				
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gpm for bours.				
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gpm for bours.				
gpm for bours. 18. FORMATIONS PASSED THROU Formations passed through the color of the co	GH	74 - 74		
gpm for bours. 18. FORMATIONS PASSED THROU PACE CONTINUE ON SEPARATE SHEET IF	GH NECESSARY	74 - 74	O H	DEPTH OF BOTTOM
gpm for bours. 18. FORMATIONS PASSED THROU PACE CONTINUE ON SEPARATE SHEET IF	GH NECESSARY	74 - 74	O H	DEPTH OF BOTTOM
gpm for bours. 18. FORMATIONS PASSED THROU Formations passed through the color of the co	GH NECESSARY	7. 7. 1/-	-/E	DEPTH OF BOTTOM

EQUESTED AND MAIL ORIGINAL TO STATE SUMER HEALTH PROTECTION, 535 WEST II. DO NO ETACH GE' GICAL/WATER PROPER LLL LOCATIL...

GEOLOGICAL AND WATER SURVEYS WELL RECORD

10 Barrely and Million Alli	tea Son	W-11 M-	6-0
10. Property owner Manager Address OD C. Chie S.		caso	
	Licens		02-24
11. Permit No. 112312	Date _	5-11.	- 24
12. Water from Remailer	13. Cou	oly	sk)
at depthtoft.	Šec.	. <u>33.7</u> .	
14. Screen: Diconin.	•	. 3777	
Length:ft. Slot		. LYE	
15. Casing and Liner Pipe	Ele	V	
Diam. (in.) Rind and Teight	Prom (71.)	To (Pt.)	MOT LOCATION IN
5 des 40	0	75	ECTION PLAT
			Egenteri Well
			#6
16. Size Hole below casing: 4 3	y in.		,
17. Static levelft. below ca	sing top which	:b is	
above ground level. Pumping l	evelft.	when pum	plog at
gpm for bours.		·	
18. PORMATIONS PASSED THRO	NOH	THICKN	DEPTH OF BOTTOM
Fell of Clas	4	0	75
Rack		75	30₽
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	- 13.5		
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		_	
(CONTINUE PR)SEPARATE SHEET 8			
• / //			16-84
• / //	<u>ия —</u> DA	TE //-	16-84 37 N 14E

	TON O	DETA	H GEO	LOGICAL	YAT	ER		_			
EPRO	PER		-		בים כ	ישטבעפ	, mc		, , ,	ión	
	GEC	الفالك	-AL)^	TAW Con		mieted					
10.	Propert			epa	121	TOLS	-	II No		10	
	Address Driller	- V D -	V F	nerin	PIC	Licer	141	<u>ayı</u>	M	***	
11.	Permit		824	56		Date .			ber	14,1978	1
	Water f		<u> </u>	notion .		_ 13. Co	mty.	<u>(</u>	$\overline{\infty}$	<u></u>	
	at dept	•		<u>10</u> ft.		27] Sec	ئًے ہ	54 24 1			
14.	Screen: Lergth			in. lot		<i>>↑ </i> Tw Ro	P. 4	We.	<u> </u>		
	_					Ele			. -		
	Casing	and L					1=		<u> </u>	BHO▼	
Die	90. (LFL.)	Û1	COV	d Weight be المرا		Prom (Pt.)) To	(r.)		CATION IN TION PLAT	
-			سري	<u> </u>			+7	<u></u>	Lot	#19, Mary	_
\vdash					一		十			d Subd.,S SE(Permit	
<u> </u>										3E (F E I W I (SE
16.	Size Ho	ole bel	oy,ca:	sing:		_in.			1		SE
16. 17.	Statle 1	level_	40	sing:	Cosin	g top_wh	ich i	s	1	<u></u> ft.	SE
16. 17.	Statle 1	level _ ground	level.	it. below Pumping	leve	g top_wh	t. wb	en pü	/	nt 10 ft.	SE
17.	Static i above a gpm for	ground	level bours	it. below Pumping] Jeve	g lop wh l 40 fi Sub put	t. wb	en pü	/ implied it 14	et /O ft.	SE
16. 17.	Static i above a gpm for	ground	level bours	it. below Pumping] Jeve	g lop wh l 40 fi Sub put	t. wb	en pu	/ implied it 14	nt 10 ft.	SE
17.	Static i above a gpm for	ground	level bours	it. below Pumping] Jeve	g lop wh l 40 fi Sub put	t. wb	en pu	/ implied it 14	et /O ft.	SE
17.	Static i above a gpm for	ground	level bours	it. below Pumping] Jeve	g lop wh l 40 fi Sub put	t. wb	en pu	/ implied it 14	et /O ft.	SE
17.	Static i above a gpm for	ground	level bours	it. below Pumping] Jeve	g lop wh l 40 fi Sub put	t. wb	en pu	/ implied it 14	et /O ft.	SE
17.	Static i above a gpm for	ground	level bours	it. below Pumping] Jeve	g lop wh l 40 fi Sub put	t. wb	en pu	/ implied it 14	et /O ft.	SE
17.	Static i above a gpm for	ground	level bours	it. below Pumping] Jeve	g lop wh l 40 fi Sub put	t. wb	en pu	/ implied it 14	et /O ft.	SE
17.	Static i above a gpm for	ground	level bours	it. below Pumping] Jeve	g lop wh l 40 fi Sub put	t. wb	en pu	/ implied it 14	et /O ft.	SE
17.	Static i above a gpm for	ground	level bours	it. below Pumping] Jeve	g lop wh l 40 fi Sub put	t. wb	en pu	/ implied it 14	et /O ft.	SE
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17.	Static i above a gpm for	ground	level bours	it. below Pumping] Jeve	g lop wh l 40 fi Sub put	t. wb	en pu	/ implied it 14	et /O ft.	SE
17.	Static above a gpm for C	ORMAT	level. bourn	it. below Pumping	ROUGI	g jop white first	t. white	ten pueset a	imping it 14	et /O ft.	SE
17.	Static above a gpm for C	ORMAT	level. bourn	Pumping ASSED TH ASSED TH ATE SHEE	T IF :	g jop white first	t. white	ten pueset a	/ implied it 14	et /O ft.	SE

SI. DO 40' STACH GE! GICAL/WATER : PROP : 2 NELL LOCATION GEOLOGICAL AND WATER SURVEYS WELL RECORD 10. Property owner Address / Driller 1 11. Permit No. Date ______ 12. Weter from 13. County Sec. ot depth_ Twp. 37 14. Screen: Diam. _ln. Length: ____ft. Slot. Rige. LL Elev. 15. Casing and Liner Pipe SHOT Dies (in.) Kind and Weight From (Ft.) To (Ft.) LOCATION IN SECTION PLAT SE HW SW 16. Size Hole below casing: 43/4 in. 17. Static level _____ft. below casing top which is_ above ground level. Pumping level _____ft. when pumping at gpm for ___ ___ bours. FORMATIONS PASSED THROUGH THICKNESS 18. 0 (CONTINUE ON SEPARATE SHEET IF NECESSARY)

Data Loc. Test D P W C

DATE 11-16-84 34 37N 14E

EQUESTED AND MAIL ORIGINAL TO STATE
SUMER REALTH PROTECTION, 535 WEST

SIGN: 1.

John C. Moore Corporation, Rochester, N.Y. Binder and holes in louver, each l'attanted 1906. 38679

TOWN Chicago COMPANY Chicago Pub. Wks Dpt. FARM Chicago Fub. Wks Dpt. No. AUTHOBITY Blueprint: 3-16-13 ELEVATION 584

COLLECTOR

DATE DRILLED

CONFIDENTIAL

Indiana Ave. and Little Cal.R.

		R.	14	E.	
37		į	-		Set 3
N]
(-				

	CMD 4 D 4	Thick	neso	Dep	t)b
No.	STRATA	Feet	In.	Feet	ln.
	Loam Clay, hard, and gravel Clay, stiff blue, and gravel Sand Clay, very hard	6 18 13 5		6 24 37 42	
4					
		·			

County Cook T.-DRILL RECORD

(30819-5M-7-34) 2 Illinois Geological Survey, Urbana.

Index No. 2334

UMER HEA	LTH PROTECTION, 5	/WA + E	•				
P.72PER ***	DETACH GEOLOGICAL	JAATE	K	ميسم			v.
<u>ت د د د</u> ت		nne		ĘŁ	. –		, n
GEU!	LOGICAL AND WAT	TER SU					. עא
_			June	27,	19	78	
10. Propert	y owner I and and	Jaka	<u> </u>	Well	l No	. —_	
	s 123 H. crthwe						
Driller	No		Ticeus	ie No	721	<u>///</u>	
			Date 13. Cou	210	C	cok	
	remFermation						111
	b toft.		Sec.			<u> </u>	- -
	: Dicmin. :ft. Slot		Twp			·	
Lengin 10≤!'	1475' of 5% of	7 'ha:	nge	·		· [
	and Liner Pipe	1	~ F16.	v			1.
Diam. (in.)	Kind and Weight		From (Ft.)	7. /	,,,		SHOW
						LO	CATION IN
6	galy. seamless		<u>+1</u>	60			SL, 1475
	·			<u> </u>			SW
		1	•	ļ :		(permit)
17. Static l above (ple below casing:	casing	top whi	ch is whe	ם סע		
17. Static above appm for	ground level. Pumpin hours.	casing ng level	top which	. whe	n pu		: g at:
17. Static above approximately	levelft. below ground level. Pumpin	casing ng level	top which	. whe	n pu	mpinç	: g at:
17. Static above appm for	ground level. Pumpin hours.	casing ng level	top which	. whe	HICK	mpinç	: g at:
above a gpm for 18. Drift	ground level. Pumpin hours.	casing ng level	top which	. whe	ніск	mpinq :NESS	DZPTH O. BOTTOM 59
above of abo	ground level. Pumping hours. ORMATIONS PASSED TO	casing ng level	top which	. whe	л ри 5	mping NESS	DEPTH 0 BOTTOM 59 420
above of abo	ground level. Pumpin hours.	casing ng level	top which	. whe	л ри 5	mpinq :NESS	DZPTH O. BOTTOM 59
above of abo	levelft. below ground level. Pumping hours. ORMATIONS PASSED TO Shale	casing	top which	. whe	36 36	mping NESS	DEPTH 0 BOTTOM 59 420
17. Static labove of gpm for 18. Drift Lime Lime &	ground level. Pumping hours. ORMATIONS PASSED TO	casing	top which	. whe	36 36	mping	DEPTH 00 BOTTOM 59 420
17. Static labove of gpm for 18. Drift Lime Lime &	levelft. below ground level. Pumping hours. ORMATIONS PASSED TO Shale	casing	top which	. whe	36 36	mping	DEPTH O BOTTOM 59 420
17. Static labove of gpm for 18. Drift Lime Lime &	levelft. below ground level. Pumping hours. ORMATIONS PASSED TO Shale	casing	top which	. whe	36 36	mping	DEPTH O BOTTOM 59 420
17. Static labove of gpm for 18. Drift Lime Lime &	levelft. below ground level. Pumping hours. ORMATIONS PASSED TO Shale	casing	top which	. whe	36 36	mping	DEPTH O BOTTOM 59 420
17. Static labove of gpm for 18. Drift Lime Lime &	levelft. below ground level. Pumping hours. ORMATIONS PASSED TO Shale	casing	top which	. whe	36 36	mping	DEPTH O BOTTOM 59 420
17. Static labove of gpm for 18. Drift Lime Lime &	levelft. below ground level. Pumping hours. ORMATIONS PASSED TO Shale	casing	top which	. whe	36 36	mping	DEPTH O BOTTOM 59 420
17. Static labove of gpm for 18. Drift Lime Lime & Shale	level	casing g level	top whi	whe	36 36	mping	DEPTH O BOTTOM 59 420
17. Static labove of gpm for 18. Drift Lime Lime & Shale	Shale Solutions Passed Transplant Shale E ON SEPARATE SHEE	Casing level HROUGH	top whi	whe	36 36	mping	DEPTH O BOTTOM 59 420
17. Static labove of above of	evelit. below ground level. Pumping hours. ORMATIONS PASSED TO Shale Shale E ON SEPARATE SHEE 'ehling 'ell'.	ET IF N	top white to the state of the s	whe	я ри ніск 36 2	mping	DEPTH O BOTTOM 59 420 446 450
17. Static labove of gpm for 18. Drift Lime Lime & Shale	evelit. below ground level. Pumping hours. ORMATIONS PASSED TO Shale Shale E ON SEPARATE SHEE 'ehling 'ell'.	Casing level HROUGH	top white to the state of the s	whe	ы ри ніск 36 2	mping (c)	DEPTH OF BOTTOM 59 420 446 450
17. Static labove of above of	evelit. below ground level. Pumping hours. ORMATIONS PASSED TO Shale E ON SEPARATE SHEE	ET IF N	ECESSAR, Inc.	whe	п ри ніск 36 2	mping (NESS (C) (C) (C) (C) (C) (C) (C) (C) (C) (C)	59 420 446 450
17. Static labove of above of	evelit. below ground level. Pumping hours. ORMATIONS PASSED TO Shale E ON SEPARATE SHEE	ET IF N	top white to the state of the s	whe	э ри 36 2	7/7/6. # 0- 4	59 420 446 450

120911- 50M Costage-

ILLINOIS GEOLOGICAL SURVEY, URBANA

	Thickness	Tee	Barran
GEOLOGICAL TOPS:			
Racine formation Joiliet formation Romeo nember Markgraf member Kankakee formation Edgewood formation Ft. Atkinson formation- May Top, 170		308 337 367 457	290 337 308 337 367 454 504
Scales formation Wise Lake formation - Gal. Top, -29 Eunlieth formation Guttenberg formation Nachusa formation Grand Detour formation Mifflin formation Pecatenica Formation Ancell Group - GSC Top, -354		807 814 843 843	611 687 807 814 843 873 905 938 995
Total depth			995
Bore Hole Record: 3" 61-995' Casing Record: 4½" surface -45' 3" surface -61' Detailed report field including interpreport on geophysical logs and stratigraturery. Caliper log filed Density log filed Nuclear log filed 3-Dimensional Veloc	pphic		
*Near the corner of 130th Street and Interstate 94			

COMPANY FARM	Chicago Sanitary District Deep Tunnel Test Hole No. DH-6
DATE DRILLED	January 22, 1968 COUNTY NO. 896
AUTHORITY	Birdwell Div.
ELEVATION	584' G. L Company
LOCATION	NW NW NE *
CBARIA	CCCK

	Thickness	Tep	Betten
GEOLOGICAL TOPS:			
Racine formation		70	315
Joliet formation		315	362
Romeo member		315	326
Markgraf member		326	362
Kenkakee formation		352	388
Edgewood formation		358	443
Brainard formation - May. Top 147'		443	1 483
Ft. Atkinson formation		483	527
Scales formation		527	640
Wise Lake formation - Cal. Tap, - 50'		640	774
Dunlieth formation	j	714	827
Guttenberg formation		827	832
Nachusa formation	! !	832	662
Grand Detour formation		862	9
Mifflin formation	Ì	906	9
Pecatonica formation		940	972
Ancell group - CSP Top, - 362		972	1029
Total depth			1029
Bore hole record 6" - 0-63'			
3 ¹ ." 63-216'			j
3" 216-1030'			
Casing: 42n 0-63'			1
Detailed report filed including inter	rretatio	מי	İ
report on geoptysical logs and strat	igraphic	· :	!
summary			
Density log filed Nuclear log file	al i	,	i
Caliper log filed 3-Fimensional Vel	edity 1	g file	ģ
omplet and annual beautiful and an annual and an annual and an annual and an annual and an annual and an an annual and an an an an an an an an an an an an an		•	
"North of Calumet Expressway & Beaubi	en Mood	turno	ff.

OMPANY	Chicago Senitary District	
EIA	Doep Turnel Test Hole No. DM-10	
ATE DRILLED	January 30, 1968 county No. 884	
YTIRO!!TU	Birdwell Div.	
LEVATION	590 G.L M.S.L Company	
ROLTAGO	SE NE SE *	
	ČI-5-7	35 3:2

516. STATE OFFICE BUILDING, SPRINGFIELD, ICAL / WATER SURVEYS SECTION. BE SURE TO

	LOGICAL AN	ND WATER S	URVEYS Compl	WELL R eted 8-	ECO.	RD 72	
10. Proper	<i>'</i>	I D 6	arb.	Well No			
Interiober	ss / 38 4 Ca.	7.	11/1/	ican	-	1411	
	K+K	Paul V		e No.	4	518	
	- 4 -	4	Date	8-8	- 72		
11. Permi	from St Pete	a landate	Date ⊈_13. Com				
	Form	ation	-			1 1	<u>, </u>
at dep	th <u>300</u> to <u>//-</u>	<u>25 ft</u> .		36.7	₹		}
14. Screen	: Diam	in.	Twp	. <u>37<i>71</i></u>			1
Lengt	h:ft. Sl	ot	Rge	145	. 🗀	 	1
			Elev	/		 - - 	┨
15. Casin	g and Liner Pi		ور خفف م		. L-		j
Diam. (in.)	Kind and	d Weight_	From (Ft.)	To (Ft.)		SHOW CATION IN	
1211	Lala.	36.14.	0	85		TION PLAT	
011	,,	-2/ 11	85	198	-	'SL,700	WL
		0.6	3)	C 12	of i		
	<u> </u>					ate Wat	er
16. Size F	lole below cas	ing:	in.			rvey)	
	level 3cc ff					<u></u>	
	ground level.		el <u>760</u> it.	when pu	mping	ot 500	-
gpm ic	or <u>12</u> hours	•					
18.	FORMATIONS PA	SSED THROUG	ЭН	Isinex	Č Č	DEPTH OF BOTTOM	. * _
Orier	Lyrton			0		85-	_
Ra	of form	ation		85	- 4	450	
1	111			11-		110	•
	all_	<u> </u>		73.		665	_
Pu	· B			66.	5	990	
011	2 + 1.	1-1-		CC	_	112	_
AT	eles to	rasurel	<u></u>	1790	<u> </u>	1/23	-
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	<u>intenence</u>	- Ciria -			<u>ی</u>		-
	JE ON SEPARA	_		n			
/	Jaul K		i a	//		1-75	
SIGNED (1011 X. IL.	uerim	D/	TE Z	ے کی	,-/ <-	2
		Laborer	:12 ./2	13 1			
		10000011	13.42/	۲}			
COOK		(<u>i</u>	26-	377117	

UMER HEALTH FRONTET IN SIS MEST 1. DO NOT DETACH GEOLOGICAL/WATER PROPER 1.OCAT

GEOLOGICAL AND WATER SURVEYS WELL RECORD Completed 5-22-77 10. Property owner Date 5-23-197 11. Permit No. 13. County Cook 12. Water from, et depth _O Twp. 37N 14. Screen: Dian. Lergth: ____ft. Slot. Rge. 14E Elev. 15. Casing and Liner Pipe EHOT LOCATION IN BECTION PLAT From (Ft.) To (Ft.) Kind and Weight Diem. (in.) 70 Lot 1, block 3, Ford Annex Subd., E/2 SE 16. Size Hole below casing:_ in. SE (permit) 17. Static level ft. below casing top which is. above ground level. Pumping level 2011. when pumping at gpm for _____ hours. FORMATIONS PASSED THROUGH THICKNESS 18. (CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED DATE 3/3/77
COUNTY No 25620

COOK

36-37N-14E

EQUESTED AND MAIL URIGINAL TO STATE DE-116, STATE OFFICE BUILDING, SPRINGFIELD, ICAL / WATER SURVEYS SECTION, BE SURE TO

	GEOLOGICAL AND WATER SU!				
	Scavenger 3 ()	, <i>()</i> Cçn	rrleted	3-2	[
10. F	Property owner With Seling Mar	<u>Line</u>	Well No.		<u>7 .S</u>
	Address 1345 + Edunit	Excu	Cours	<u>; </u>	<i>کذی</i> ۔
1	Driller Hellimani	Licens	e No	<u>lci</u>	
11.	Permit No. <u>8696</u>	. Date <u> </u>	ليتحم	يد	1465
12. V	Water from Line in Line	13. Cour	<u>سبب _</u> ۱۷	<u> جربہ</u>	· ·
	at depth <u>65</u> to <u>379</u> it	-,م؟	36.78		
	Screen: Diamin.		37Ai	+	~}~
	Length:it. Slot		IYE.	1-1	
		i lev	-		
15.	Casing and Liner Pipe			Ш	
Diem	(in) Kind and Weight F	frm (Ft)	To (Ft)	Loc	SHOW ATION IN
1 5	5 Stindent Steel	0	(5	SECT	ION PLAT
	Ether Cering 15			_	an en
	Pin n - 15-			Pe	rmî t'
16 9	Size Hole below casing: 5 is				
	Static level <u>20</u> It below casing	•	h is	1	
• • • •	shove ground level. Pumping level	2101	wied Dún	pina	ننځ يه
	gpm forhours.				
	FORMATIONS PASSED THROUGH		i THICKS	e ne li	NEDTH :
18.	FORMATIONS PASSED THROUGH		THICKS		BOTTCY
S.	بر ا		ļ.	1	3
	il - FÜ a		1,		
7	clin- cedi	 -		- +	<u> 18</u>
	This & Clay		4.	7	<u> (- C:</u>
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_ \$ ~	midial		26	4	1 2. (;
			_ <u>i</u>		
-					
			- 		
					
	·	•			
((CO:	NTINUE ON SERARATE SHEET IF NEO	CESSARY		 ,	
	11 11		\n_1	f	- 12-
SIGN	ED H Hollinsen	DA	TE TIL	rch	20,197
	Indian 3/2				1.
	[10] [10] [10] [10] [10] [10] [10] [10]	4			

•					•
STATE OFFICE BUILDING, S	PRINGFIELD SE SURE TO	<i></i>			-
GEULOGICAL AND W		RVEYS (Complete		5-76	HD TB
Address / 3 / / / / + Driller 2 . idre (c.)	Time	ر د Licens م Date م	e No	3/0	1 , Dec 2-77
11. Permit No. 47592 12. Water from 500 Formation	رت)	13. Com	nty		
at depth 73 to 301 ft	•	Sec. Twp			
Length:ft. Slot		_ Rge. Elev	14E		
is. Casing and Liner Pipe					
Kind and Work		From (Ft.)	To (PL)		SHOW CATION IN CION PLAT
File Carry	15			_	#15 Blk d Annex S
16. Size Hole below casing:	<u> </u>	in	<u></u>	SE	(permit)
17. Static level 26 ft. bel above ground level. Pum apin for hours.	ow casing ping level	top which 220 ft.	h is when p	mping	ft.
18. FORMATIONS PASSED	THROUGH		THIC	NESS	DEPTH OF BOTTOM
1	<u></u>			1	1
fellow flag		· · · · · · · · · · · · · · · · · · ·		8	19
List we Cary			12	<u>Z. </u>	46
il is they of the	<u>ر) د</u>		×	3	64
1	······································		22	7	301
·					Į.

CONTINUE ON SEPARATE SHEET IF NECESSARY)

CONTINUE ON SEPARATE SHEET IF NECESSARY)

DATE

COCK

COUNTY No. 25541

36-37N-14E

GE TGICAL D WATER !	SURVEYS W	E RECC	- '
2 11	Comp?	leted 6-13	-17/3
10. Property owner Jep		Well No	17
Address 13402 Calkann	- Etrice	yo de	<u> </u>
Driller - H. Halleman	License	410. 10 3	-77
11. Permit No. 48629	Date 4	Reace 7	(175
12. Water from Torrection	_ 13. Cott	Ty	
ot depth 81 to 20 Ott.	Sec.	36	
14. Screen: Diamin.	Twp.		
Length:ft. Slot	Rge.		
35 Casing and Lines Dine	Elev.		
15. Casing and Liner Pipe			
Diam. (in.) Kind and Weight	From (Ft.)		SHOW CATION IN
5 Stenland Steel	0	$\rho / 1$	#3. block
Gali. Essing 15	_	1	Hay Hess
eles. ser Et			echer Add.
16. Size Hole below casing:	_in. in Ch	icago Sub]., SE (per
17. Static level 2 1 ft. below casis	ng tọp which	h is	ftmit
above ground level. Pumping leve			g at
gpm for 3 hours. Sub. pum	p set at	190'.	
18. FORMATIONS PASSED THROUGH	H	THICKNESS	DEPTH OF BOTTOM
Lie		1	1
yellow Clay		16	17
			1
Bluetlan	<u> </u>	3/	48
Blue Clay	,	31	48
Blue Clay & Grovel	,	31	48
Blue Clay & Brovel	<i></i>	31 27 6	48 75 81
Blue Clay & Browel Smuser Limestone	<i></i>	31 27 6 119	48 75 81 200
Blue Clay & Brovel Showed Linestone		31 27 6	48 75 81 200
Blue Clay & Browel Showed Limestone	2	31 27 6	48 75 81 200
Blue Clay + Browel Shower Simestone		31 27 6 119	48 75 81 200
Blue Clay & Browel Showed Simestone)		31 27 6 119	48 75 81 200
Blue Clay of Strevel Shower Limestone (CONTINUE ON SEPARATE SHEET IF	NECESSARY	31 27 6 119	48 75 81 200
Blue Clay Blue Clay Browel Shower Limestone (CONTINUE ON SEPARATE SHEET IF SIGNED To Helman	1	X	
SIGNED H. Holleman	DA:	re june	48 75 81 200
SIGNED H. Holleman	1	re june	

OFFICE BUILDING. SPRINGFIE ER SURVEY'S SECTION BE SURE

GEOLOGICAL WATER		WELL RE ed 7-18-69	
10 Dept. Mines and Mineral	permit No. 4263	Year Year	
Property owner Ford U	· on Hall V	Vell No	
Address Neh lir	License	iva.	
1]. Weter fromFormation	1 2 /2		
ot depth to		36	
14. Screen: Diami	r Twp.,	37N	
Length:f: Slot	Ring.		
SE NE Se 15. Casing and Liner Pipe	Elev.		
Dism. in) Kind and We	right From (Ft) 7		SHOW ATION IN
6		1 < 1	MON PLAT 'S line
			5 Line 5 E 14
		NE	SE
16. Size Hole below casing 17. Static level 65 ft. be	in.	. (P	ermit)
ábove ground level. Pu	ping level 165 it. v	when pumping	c: 30
gpm fo: 3 hours			·
18. FORMATIONS LASS:	типорен	THECKNESS	ROTION
Cinder fill		5	5
Boulders agravel		20	15
Clay		50	65
grave.l		6	נר
Lime		357	758
		1	<u> </u>
	<u></u>	 	
(CONTINUE ON SEPARATE)	EET IF NECESSARY)		
SIGNED	DATE	<u>July 31</u>	16/5
SIGNED	• •		, 1 <i>366</i>
-	697		

76. 7M

Chicago Chicago Township Map No. company C. Erwin Kramer R. 14B No. Czrep, Andy No. τ. Sec 36 Authority C. Erwin Kramer, Harvey 37 Elevation 551 T.M. N Collector Date Drilled Jan. 1942 Confidential 630' 5. line SE Car E 1977 St. + Ho Thickness Depth - No. Strata Feet Feet ln. Lot 24, Block 1, Ford Annex 12 12 Sand 59 71 Clay 165 Limestone, soft 94 45" casing and shoe driven to 71' Well shot at 160' with 50 lbs. 60% gel. dun. Water level comes to 30' from surface Capacity 100 g.p.hr. Water soft, odorless and tasteless

Page 1		Thickness	Тар	Bottom
Pill Silty Clay Grave Shale Limes Hole Casin	lly silt & silt	9 10 40 :5 7 232	Тер	9 19 59 64 71 303
* v.s	Warrenville . Army Corps of Engineers VELOPE			

COMPANY	Shaver Well Drilling Company *T.J. O'Brien Lock & Dam NO. 10/59 COUNTY NO. 26484 R.T. Sasman, SWS 586.88 L.S.D. 2400', S line; 2900', W line
FARM	*T.J. O'Brien Lock & Dem No.
DATE DRILLED	10/59 COUNTY NO. 26484
AUTHORITY	R.T. Sasman, SWS
ELEVATION	586.88 L.S.D.
LOCATION	2400', S line; 2900', W line
COUNTY	COOK , 5 2212, 2300 , W 11he



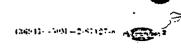
36_37N+14E

	Thickness	Top	Bottom
GEOLOGICAL TOPS:			
Recine formation		70	357
Wankesha formation	}	357	387
Jolist formation		387	419
Kankakee formation		419	441
Edgewood formation -	1	441	484
Brainard formation - Tung . Top- 102'		484	505
Ft. Atkinson formation		505	549
Scales formation		549	665
Wise Lake formation - R.J-1, 79'		665	746
Juniieth formation	1 1	746	851
Guttenberg formation		851	857
Machusa formation		857	890
Grand Detour formation]	890	925
Hifflin formation	<u> </u>	925	965
Pecatonica formation	1 1	965	994
Ancell group - Elitabate - 408		994	1044
Total depth			1044
Bore hole record: 3" - 180-1045'			
Casing record: 47n - Surface - 73' 3" - Surface - 180'			
Caliper log filed 3-Dimensional Vel		log fil	ed
Density log filed Nuclear Log filed			}
DEtailed report filed including inter	pretat	lon	
report on geophysical logs and strati	grapbi	c	
*Hear corner of 136th St. & Torrence	AVe.	•	

Chicago Sanitary District COMPANY Deep Tunnel Plan NO. DH-5 DATE DRILLED January 16, 1968 COUNTY NO. 861 Birdwell Div. AUTHORITY 586.1' G. L. - Company ELEVATION SW KE SE . LOCATION

CEGR

ידעוומי



سنبا مساور المستورين بمرقب بالمستورين بأراد		كأنت كروح والمساحد
		Titlokness To
		

-		1	
GENEGICAL TOPS:			
Racine formation Joliet Formation Romeo Member Hertgraf Member Kantakes Formation Edulated Formation Brainard Formation - Mag. Top, 110 Ft. Atkinson Formation Scales Formation Visa Lata Formation Cuttenberg Formation Guttenberg Formation Machusa Formation Machusa Formation Mifflin Formation Pecstonics Formation Ancoll Group - Cse Tap, -3912		76 326 326 340 374 401 475 491 529 721 835 841 670 911 950	374 401 475 491 529 650 721 636
Total depth			1020
Bore Hole Record: 3" - 1020' Detailed report filed including interpress on geophysical logs and stratigraphics Coliper log filed 3-Dimensional Velocity Log filed Density log filed Kucler Log filed Core #6 6662	mrax y	•	rt
* conthrost of 130th Street & Calmot	Riva		
	* 7		

COMPANY	Chicago Sonitary District
FARM	Deep Turnel Test Holo No. PH-11
	Herch 7, 1963 COUNTY NO. 883
AUTHORITY	Birdvoll Div.
ELEVATION	595' G. L Company
LOCATION	er en en e
COURTY	733D

(8811-50M-4-49) 1

ILLINOÏS GEOLOGICAL SURVEY, URBANA

ENGINEERING BORING	Thickness	Tip	Neste:
B-13			
Fill, cinders, wood, brick, concrete			7.5
Brown to gray fine sand, trace to	l		ĺ
little silt, medium dense to loose	}	ļ	18.5
Gray clay, trace of small gravel,			
tough	ſ		33.5
Gray clay, some small gravel, hard	1		43.5
to very tough Gray clay, some fine to coarse sand,			43.9
small gravel, hard			53.5
Gray clayey silt, some small to large	e		
gravel, hard			60.0
Gray clayey silt, some small gravel,		1	1
hard	1		70.0
	j l		i
•			
			1
]		}
			İ
			l
]		
	1		
•			
Typed by Warrenville Office			
Logs of 16 borings filed at Warrenvi	1,		
NO ENVELOPE	† 1 t		

HARMWaste Management, Inc.
HG. B-13
HATE BRILLED 8/2/73 COUNTY No. 26264
HITHORITY COMPANY
HEVATION

ACATTOR

Company

NW, NE, SW

COOK

36-37N-1

ENGINEERING BORING	Thinkness	Tup	lettes
B-9			
Misc. Fill - Topsoil, brick, cinders wood, etc. Silty fine sand & topsoil, trace roots - brown and black Fine sand, trace silt - brown and slightly ray - medium dense-wet Silty clay gray - stiff to tough			10.0 32.0
Typed by Warrenville Office Logs of 9 barings filed at Warrenvil	l e		

COMPANY Soil Testing Services

FARM Waste Malagement of Ill., Inc. 85.

DATE DRILLED 12/25/73

AUTHORITY COMPANY 2626 ы тарын тумы. 26263 AUTHORITY **ELEVATION** NW, NW, SW. LOCATION

COURTY

(8811-5021-6-65) 14-

ace 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

ENGINEERIA BORING	Thickness	Тор	Bottom
139-8			
		·	1
WATER	}		2.5
Brn & blk SLAG FILL	}		3.5
Loose brownish black org SILT	:		5.5
Loose gry fine SAND, occ silt	į	j	9.0
Tough gr. silty CLAY, tr sand & pebl	:		11.5
Very to gry silty CLAY, tr sand &			1
pebb			41.0
Hard gry silty CLAY, occ sand & pebl) ;		55.0
Very dense gry clayey SILT, occ sand	1		
& pebb	-		61.0
Many Consecutive to My GRAVEL, some			
clayey silt			80.3
Gry broken dolomitic LIMESTONE			ز.90

Typed by Warrenville

Logs of aborings filed at NE III Office City of ago. Dept. of Pub. Wks. Bur. of Eng.

COMPANY City of Chgo. Dept. of Pub. Wks.

FARM E. 130th St. Bridge NO. 130-8

DATE DRILLED 1:/56

AUTHORITY Company

ELEVATION

LDCATION No. NE, NW

3G-37N-14E

John C. Moore Corporation. Rochester, N.Y. Binder and holes in leaves, each Patented 1906. 386790

TOWN Chicago TOWNSHIP

COMPANY Chigo. Fub. Wks. Dept.

FARM Chicago Fub. Wks. Dept.

AUTHORITY Blueprint: 3-16-13

ELEVATION 531

37 F

Map No. 142

36

COLLECTOR CONFIDENTIAL

Torrence Av.at N. Bank Cal.R.

No.	STRATA	Thick	ees	Dept	h
	GINALA	Fest	In.	Feet	ln.
	River sand Clay, blue Sand, blue mixed Clay, hard blue Sheil rock	16 19 4 26 8		16 35 39 65 73	

County COOK

Index No. 2336

T .- DRILL RECORD

(30\$19-5M-7-34) 2 Illinois Geological Survey, Urbans.

age 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strate	Thickness	Top	Bottom
Access Road Boring No. 1			
Drab yellow, non-plastic, fine to com	5e		
sand (62), fine to coarse silt (25)			
some clay (13), alluvial	5- q		5- 0
Yellow gray, soft, plastic, fine to	1 1		
coarse silt (62.5), clay (30), some	1 1		İ
fine to coarse sand (7.5), alluvial	.		
some shale fragments present	5- q		10-0
Blue, soft, plastic, fine to coarse			
silt (39), clay (37), fine to coarse	b		ļ.
sand (19), some fine to medium gra-			
vel (5), alluvial	5- d		15- 0
Blue, soft, plastic, clay (51), fine	to		
coarse silt (32), fine to coarse	1 1		
s sand (17), alluvial	5- d	•	20- 0
Blue, fairly stiff, plastic, clay (51			
fine to comese silt (32), fine to			ł
coarse sand (17), alluvial	5-0		25- 0
Blue, fairly stiff, plastic, fine to			
coarse silt (39), clay (37), fine			
to coarse sand(19), some fine to	1 1		<u> </u>
medium gravel (5-7), till	6- d		31-0
Gray, fine sand (93), trace of fine to			
coarse silt(1), trace of clay(1),			
till pocket	1-0		32- 0
Blue fairly stiff, plastic, fine to	-		
coarse silt(39), clay(37), fine to	1 1		}
coarse sand (19), some fine to medi-	1 1		
um gravel(5), till	3-0		35- 0
Blue, very stiff, plastic, fine to			F _
coarse silt (39), clay (37), fine to			ł
coarse sand (19) some fine to medium			
gravel (5), till	5- d		40-0

Company Corps of Engineers

FARM Calumet-Sag Canal-Access Roadso.

DATE DRILLED Prior to 10-1-46 COUNTY NO. 32

AUTHORITY Corps of Engineers

ELEVATION 580.0 MSL

COUNTY NE., SE., NE.

25 -----

Page

ILLINOIS GEOLOGICAL SURVEY, UREANA

	Strata	Thiokness	Tep	Bettom
silt (25)	pact, non-plastic, fine to sand (62), fine to coarse), some clay(13), till y compact, non-plastic, fine se silt(45), fine to coarse	5- 0	,	5 4 0
sand (37)	.5), some clay(12.5), trace to redium gravel(5), till	≥8		50-0
Reference	ad Boring No. 1 set of drawings 4040, map files.			
·	ake quadrangle.			

Strata	Thickness	Tep	Bettom
Access Road Boring No. 2			
Gray, soft, plastic, clay (43), silt			1
(36), fine to coarse sand (21),	1 1		
alluvial	5-0		5-0
Dark gray, soft, plastic, clay(54.5),	, l		
fine to coarse silt (33), fine to			
coarse sand(12.5), alluvial	20-0		25- 0
Dark gray, soft, non-plastic, fine to	۱ ۱		į
coarse sand (66), fine to coarse			1_
silt(23), clay(11), alluvial	5-0		30- 0
Dark gray, medium stiff, non-plastic,			1
fine to coarse sand (96), trace of			l
silt(3), and trace of clay(1),			
alluvial or till sand	1-0		21-0
Blue, medium stiff, plastic, clay (37)	•		
fine to course silt (34), fine to	1		
coarse sand (22), some fine to large			
gravel(7), till	7-0		38- 0
Dark gray, medium stiff, non-plastic,	1 1		1
fine to coarse sand (36), trace of			
silt(3), and trace of clay(1),	i		
alluvial or till sand	1-0		33-0
Blue, medium stiff, plastic, clay (37)	>		
- fine to course silt (34), fine to	1		
coarse sand (22), some fine to large			
gravel(7), till	1-0		40-0
Blue, stiff, fine to coarse silt (35),	1		
clay(31), fine to coarse sand(23),			
some fine to large gravel(11), till			45- 0
Blue, very stiff, non-plastic, fine t	P		
coarse silt (60), clay (23), fine to coarse sand (13), trace of fine to			
medium gravel (4) , till	ا ج ما		50 0
- Reference set of drawings 4040 p5-25	5-0		50- 0

company Calumet Lake quadrangle

FARM Calumet Engineers

Calumet Engineers

Calumet Engineers

Calumet Engineers

Corps of Engineers

ELEVATION

SW.,SW., NE.

COUNTY

COOK

36-37K-17



Strata	Thiskness	Top	Bottom
Access Road Boring No. 3			
Drab yellow, soft, plastic, clay (56),			
fine to course silt (32), some fine	1		
to coarse sand(12), alluvial	5-0		5-0
Drab yellow, soft, plastic, clay (32.5)	,		
fine to coarse silt (17.5), alluvial	5-0		10-0
Yellow gray, soft, plastic, clay (56),	ŀ		
fine to coarse silt (32), some fina			
to coarse sand (12), alluvial	5-0		15-0
Yellow gray, stiff, plastic, clay (56)	, }		
fine to coarse silt (32), some fine			
to coarse sand(12), blue shale	İ		
fragments present, alluvial	5-0		20-0
Gray blue, semi-soft, plastic, fine	i		
to coarse silt (57.5), clay (26), fine	1		
to coarse sand(16.5), alluvial	5-0		25
Blue, semi-soft, non-plastic, fine to			<u> </u>
coerse silt (74), fine to coerse sand			i
(20), little clay(6), alluvial	5-0		30-0
Blue, semi-soft, plastic, fine to			
coarse silt(40), fine to coarse		•	}
sand (27), clay (18), fine to large	}		ļ
gravel(15), till	5-0		35-0
Gray, semi-compact, non-plastic, fine			
to coarse sand (50), fine to coarse			
silt(13), clay(12), with fine to			
large gravel(20), till pocket	2-10		27-10
Gray, semi-compact, non-plastic, fine			
sand (98), trace of fine silt(1),			
trace of clay(1), till pocket	1-2		39-0
Blue, stiff, clay (56), fine to coarse			}
silt (32), some fine to coarse san!			
(12), ±111	المحدا	· · · · · · · · · · · · · · · · · · ·	<u> </u>

COMPANY Corps of Engineers

FARM Calumet—Sag Canal—Access Roads*3.

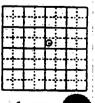
DATE DRILLED Prior to 10-1-46 COUNTY NO. 30

AUTHORITY Corps of Engineers

ELEVATION 582.0 MSL

LOCATION SW., SW., NE.

COUNTY Cook



35-37N-

Page	

Page	2 ILLINOIS GEOLOGICAL SURVEY, URBAN	^		
	3rm	Talciment	Тер	Bottom
	lue, semi-stiff, plastic, fine to coarse sand (36), fine to coarse silt (30), clay(14), fine to large gravel (20), till lue, semi-stiff, fine to coarse silt (39), clay (25), fine to coarse sand (25), fine to large gravel (11), till	5-0 5-0		45 – 0 50 – 0
Re	ocess Road Boring No. 3 eference set of drawings 4040 5-25 in map files.			
CA	lumet Lake quadrangle			

C∞k

36-37F-14E

COUNTY

Strata	Thickness	Tap	Bottom
ACCESS Road Boring No. 4			
Drab yellow, soft, plastic, clay			
(47.5) fine to coarse silt (46.5)	il i		Ĭ
some fine to coarse sand (6),	ł		
mixed with layers of fine sand (8	3.5)]
fine to coarse silt (10), trace			
of clay (1.5), alluvial	5- 0		5- 0
Yellow gray, soft, plastic, clay	!		l l
(47.5), fine to coarse silt	1	:	1
(46.5), some fine to coarse sand	i i		l
(6), alluvial	5- 0		10- 0
Yellow gray, soft, plastic, clay	1 1		l
(69), fine to coarse silt (29),]
some fine sand (2), alluvial	5-0		15- 0
Yellow gray, soft, plastic, clay (60)		<u> </u>
fine to coarse silt (30), some	1 1		_
fine to coarse sand (10), alluvia	1 5-0		20-0
Blue, soft, plastic, clay (47.5), fi	ne i		
to coarse silt (46.5), some fine			Ì
to coarse sand (6), shells	1		
present, alluvial	5- 0		25- 0
Blue, stiff, plastic, clay (60), fin			·
to coarse silt (30), some fine to	1		
coarse sand (10), alluvial	5- 0		30- 0
Blue, semi-stiff, plastic, fine to]		
coarse silt (85), clay (29), some	1		
fine to coarse sand(6), till,			35- 0
top 1 possibly alluvial	5- 0		0 حود
Blue, semi-stiff, plastic, fine to			1
coarse silt(40), clay(33), fine			ļ
to coarse sand (22), some fine to	5- 0		40-0
large gravel (5), till) - 0		40-0

Company Corps of Engineers

FARM Calumet—Sag Canal—Access Roads 4

DATE DRILLED Prior to 10-1-46 COUNTY NO. 29

AUTHORITY Corps of Engineers

ELEVATION 582.0 MSL

LOCATION NW., NW., SR.,

COUNTY COOK

Papa 1

ILLINOIS GEOLOGICAL SURVEY, URBANA

Strata	Thickness	Top	Bottom
Access Road Boring No. 5			
Drab yellow, soft, plastic, clay (53),	} .		}
fine to coarse silt (39), fine to			
coarse sand (8), mixed with layers	1		1
of fine sand (32), some fine to	1		}
coarse silt(7), and trace of clay	}		
(3), fine to large gravel(8),	[
alluvial, shells present	5- 0		5-0
Yellow gray, soft, plastic, clay (53),	ا حر		, , ,
fine to coarse silt (39), fine to			
coarse sand (8), alluvial	5-0		10- 0
Yellow gray, soft, plastic, clay (47),	ا سر		10- 0
fine to coarse silt (35.5), some			
fine to coarse sand (17.5), alluvia	1 10	,	20- 0
Gray blue, semi-stiff, plastic, clay	1 -10-	الو	a)= 0
(47), fine to coarse silt (35.5),			
some fine to coarse send (17.5)			
alluvial	5- 0		25- 0
			2)- 0
Blue, stiff, plastic, fine to coarse silt (47.5), clay (40), fine to coar	20		
sand (12.5), probable till	5- 0		30- 0
Blue, sami-stiff, plastic, fine to	الأسرا		<i>_</i>
comme silt (44), clay (27), fine to			
coarse sand (23), some fine to larg			
gravel(6), probable till	5- 0		35- 0
Blue, very stiff, plastic, clay (40),			ال المراز
fine to coarse silt (40), fine to			
coarse sand (16.5), some fine to	ł		
large gravel (3.5), till	5- c		40- 0
Blue, very stiff, plastic, fine to		• •	4 5 - 5
coarse silt(44), clay(27), fine to			
coarse sand (23), some fine to larg			
gravel(6), till	10- 0		50 -0
Access road Boring No. 5 Reference se	C 01 (TAVING:	
compagorps of Engineers 4040 p5-25 i	qam c	fires.	
FARM CELUMO - Sag Canal - Access Roads No.		 	
DATE DRILLED Prior to 10-1-46 COUNTY NO.	58		
AUTHORITY Corps of Engineers		}- • ઼-{-•઼•઼	+
ELEVATION 581.0 MSL			
LOCATION SE., NE., SE.		نلنا	لنلنا
COUNTY COOK		36-3	7N-14E

Page ILLINOIS GEOLOGICAL SURVEY, URBAN	IA .		
Strata	Thickness	Tep	Bottons
Blue, very stiff, plastic, fine to coarse silt(40), clay(33), fine to coarse sand(22), some fine to large gravel(5), till	10-	o O	50- 0
Access Road Boring No. 4			
Reference set of Drawings 4040 p5-25 in map files.			
Calumet Lake quadrangle	Î	1	}

COOK COOK

36_37K_1.K

APPENDIX II-B

BOREHOLE LOGS DOLTON RECYCLE CENTER

II-B-1 1979 INVESTIGATION

II-B-2 1981 INVESTIGATION

II-B-3 1983 INVESTIGATION

II-B-4 1988 INVESTIGATION

APPENDIX II-B-1
1979 INVESTIGATION



SALISBURY ENGINEERING INC.

P.O. BOX 270 1501 E. MAIN STREET GRIFFITH, INDIANA 46319
GRIFFITH PHONE (219) 924-6690 CHICAGO PHONE (312) 375-9092

June 8, 1979

File 4635 - Report #1

McKesson Chemical Company 455 Joe Orr Road Chicago Heights, Illinois 60411

Subject: Soil Test Borings For

Preliminary Subsurface Exploration Barker Oil Property

Barker Oil Property Dolton, Illinois



Enclosed is our report on the preliminary subsurface exploration for the Barker Oil property site located in Dolton, Illinois. This work was completed in accordance with authorization given by Mr. Ron DeMeese and your P.O.#5535-5119.

The report outlines the details of the exploration, general site conditions, along with the foundation bearing properties of the soil which may serve as a technical record that will be most pertinent to the architect, designer, and field engineer. The appendix contains information to be used as reference and discusses standard engineering details.

We appreciated the opportunity to be of service to you and trust that our work is in order. If there are any questions about this report or if we may be of any additional service to you on this project, please do not hesitate to call.

Very truly yours,

SALISBURY ENGINEERING INC.

and the control of th

M. H. Salisbury, P.E.

MHS:PK:dl

Enclosure



SALISBURY ENGINEERING INC.

P.O. BOX 270 1501 E. MAIN STREET GRIFFITH, INDIANA 46319
GRIFFITH PHONE (219) 924-6690 CHICAGO PHONE (312) 375-9092

Jun**e** 8, 1979 F11ê:4685 - Report #2

McKesson Chemical Company 455 Joe Orr Road Chicago Heights, Illinois 60411

Subject: Additional Test Boring:

Barker Oil Plant Dolton, Illinois

Gentlemen:

At the request of Mr. Ron DeWeese and as authorized by your P.O. #5535-5235, we have made an additional test boring at the Barker Oil Plant in Dolton, Illinois. This boring is numbered as #12 and was drilled to a depth of 25.0 feet on May 31, 1979. The boring location at the site was directed by your representative Mr. Bob Nagle; this location is indicated on a plan attached as Exhibit 1.

Our field work was performed in the same manner as outlined in our report for the borings drilled previously (report #1). However, all samples for this additional boring were taken by your representative and the boring log which is presented on Exhibit 2 represents the visual description of the soil made by our drill-crew. The log also shows information about the ground water, standard penetration blow count ('N' value), calibrated pocket penetrometer reading (which is an estimated value for the 'Ou').

He appreciated the opportunity to be of this additional service to you. If you have any additional questions about the soils density or stiffness, etc., for this test boring please do not hesitate to call us.

Very truly yours,

SALISBURY ENGINEERING INC.

A STATE OF THE PARTY OF THE PAR

M. H. Salisbury, P.E.

MHS:PK:dl

Attachment

INSPECTION . INVESTIGATION . TESTING . ANALYSIS . REPORTS
BUILDINGS . BRIDGES . HIGHWAYS . SITE DEVELOPMENTS

SOIL CONDITIONS

DETAILED DESCRIPTIONS OF THE SOIL ENCOUNTERED AT EACH BORING LOCATION ARE GIVEN ON THE TEST BORING LOGS, EXHIBIT 3 THROUGH 11. THE BORINGS SHOW EITHER THE NATURAL TOPSOIL AT THE SURFACE OR FILL COMPOSED OF SLAG, CINDERS, ASPHALT PAVING, ETC. BELOW THESE SURFICIAL MATERIALS, MOST OF THE BORINGS SHOW SOME LOOSE, MOIST OR WET SAND WHICH IS GENERALLY LESS THEN 5.0 FEET DEEP, EXCEPT FOR THE AREA OF BORINGS #6 AND #10 WHERE THE SAND EXTENDS TO DEPTHS OF OVER 10.0 FEET. IN ADDITION, THERE IS SOME SOFT ORGANIC SOIL IN THE AREA OF BORINGS #6. THE REST OF THE SOIL IS CLAY, IN A RELATIVELY STIFF CONSISTENCY, WHICH BECOMES MORE STIFF WITH THE INCREASE IN DEPTH. THE HARD CLAY WAS FOUND ONLY IN A FEW BORINGS NEAR THE END OF THOSE BORINGS. WE EXPECT THAT THE HARD CLAY LIES DIRECTLY ON LIMESTONE BEDROCK.

GROUND WATER

THE GROUND WATER WAS ENCOUNTERED IN MAJORITY OF THE BORINGS AND WAS FOUND ASSOCIATED WITH THE SAND OR FILL WITHIN THE UPPER FEW FEET FROM THE SURFACE. THIS WATER APPEARED TO BE PERCHED ABOVE THE LESS PERMEABLE CLAY. AS SUCH, IT IS EXPECTED THAT ITS LEVEL MAY FLUCTUATE FROM THE EFFECTS OF PRECIPITATION, RATE OF INFILTRATION, SURFACE DRAINAGE AND SEASONAL VARIATIONS.

ANALYSIS

GENERAL

THE ENGINEERING ANALYSIS TO ASSESS THE CONDITION OF A SITE TO SUPPORT THE FOUNDATION FOR ANY TYPE OF CONSTRUCTION IS BASED PRIMARILY ON

FOUNDATION AND SOIL BEARING CAPACITY

IT MAY, GENERALLY, BE CONSIDERED THAT THIS SITE HAS MIXED SOILS NEAR THE SURFACE AND A RELATIVELY STIFF AND UNIFORM CLAY DEEPER IN THE PROFILE. BECAUSE THE MIXED SOILS ARE RELATIVELY SHALLOW THEY COULD BE EASILY UNDERCUT AND REPLACED WITH A NEW FILL, SUCH AS CRUSHED STONE FILL WHICH WOULD IMPROVE THE SUBGRADE FOR THE SLAB-ON-GRADE CONSTRUCTION.

THE NATURAL CLAY, IS CONSIDERED ADEQUATE TO SUPPORT THE FOOTINGS AT A REGULAR FOUNDATION DEPTH FOR MOST OF THE SITE. IN GENERAL, THESE FOOTINGS COULD USE A SAFE SOIL BEARING OF ABOUT 2000 PSF, AND BOTH THE FOOTINGS AND FOUNDATION WALLS WOULD NEED SOME STEEL REINFORCEMENT TO REDUCE THE EFFECTS OF A POSSIBLE SMALL DIFFERENTIAL SETTLEMENT.

IT APPEARS THAT ONLY THE AREA OF BORINGS #6 AND #10 DO NOT HAVE ADEQUATE BEARING SOIL FOR A SHALLOW SPREAD FOUNDATION IN THE UPPER 4 OR 5 FEET BECAUSE THE MIXED, LOOSE AND SOFT SOILS, AT THESE TWO BORINGS LOCATIONS IS APPROXIMATELY 12 FEET DEEP. THESE AREAS, THEREFORE, WOULD REQUIRE A DEEPER FOUNDATION. ALSO A DEEP FOUNDATION, SUCH AS CONCRETE FILLED AUGERED CAISSONS OR PILES COULD BE UTILIZED FOR ANY OTHER BORING AREA IF IT BECOMES NECESSARY TO SUPPORT SOME HEAVY LOADED FOOTINGS FOR WHICH THE SOIL BEARING OF 2000 PSF NEAR THE SURFACE, IS NOT ADEQUATE.

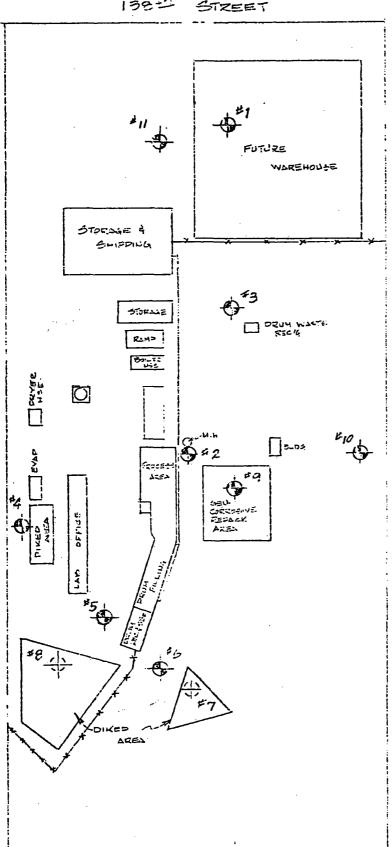
WITH THE RESPECT TO THE RESULTS OBTAINED IN EACH INDIVIDUAL BORING WE CONSIDER THE FOLLOWING TO BE APPLICABLE:

TEST BORING #1 AREA WILL NEED REMOVAL OF THE TOPSOIL, WHICH IS ABOUT

SALISBURY ENGINEERING INC. 1501 EAST MAIN STREET, GRIFFITH, IND.

BORING LOCATIONS





NOTES:

- 1) ALL TEST BORINGS ARE SHOWN IN THEIR APPROXIMATE LOCATION.
- 2) TEST BORINGS Nos. 7 AND 8 WERE NOT DRILLED (INACCESSIBLE TO DRILL RIG)



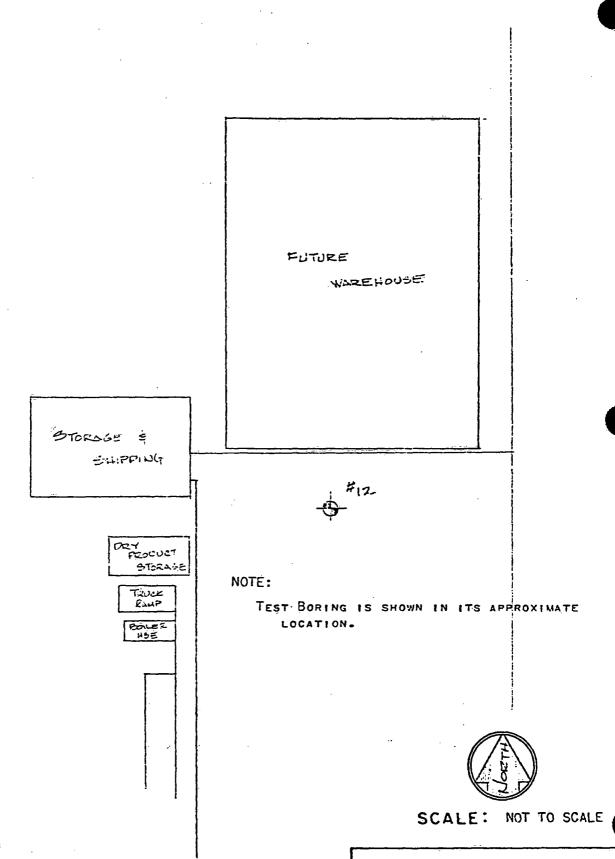
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BARKER OIL COMPANY PROPERTY 138TH STREET DOLTON, ILLINOIS

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SALISBURY ENGINEERING INC. 1501 EAST MAIN STREET, GRIFFITH, IND.

BORING LOCATIONS



ADDITIONAL BORING BARKER OIL COMPANY DOLTON, ILLINOIS

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THE "N" VALUES IN THE STANDARD PENETRATION TEST AME BLOWS PER FOOT REQUIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER USING A 140 POUND WEIGHT FALLING FREE FOR A DISTANCE OF 30".

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8. O. S.

** STT. W.D. R. A.D. COMPLETED SAME ** FT. HR. A.D. PILE PR HYMOTROS: FT. HR. A.D. FILE NO. 1635 ** FT. HR. A.D. FILE NO. 1635 ** SOIL DESCRIPTION ** SOIL DESCRIPTION ** SOIL DESCRIPTION ** SOIL DESCRIPTION ** SOIL DESCRIPTION ** SOIL DESCRIPTION ** CASE OF THE SAME SAME SAME SAME SAME SAME SAME SAM	150	LISBURY ENGINEERING IN E. MAIN STREET, GRIFFITH, I TER LEVEL DATA STARTED 5-19-79					F TEST BORING NO5
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GRAVEL, SAND SEAMS, MOIST 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.	-			\perp	4		STRONE GASOLINE ODER IN SAMPLE 32
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12.5 VERY STIFF TO HARD SILTY CLAY, DAMP 22.5 Water Level at 0.3' in a few seconds; a little oil floating on surface of water. LEGEND: *Water entering Doring 21.5' at fast rate through slag or gravel.			200	4	İ	1	17171111
12.5 VERY STIFF TO HARD SILTY CLAY, DAMP 25.0 **WATER LEVEL AT 0.3' IN A FEW SECONDS; A LITTLE OIL FLOATING ON SURFACE OF WATER. LEGEND: **WATER ENTER ING BORING \$1.5' AT FAST RATE THROUGH SLAG OR GRAVEL.				Ī]	
Test Boring ended at 25.04 *Water level at 0.3' in a few seconds; a little oil floating on surface of water. Legend: **Water entering Boring @1.5' at fast rate through slag or gravel.	<u> </u>			+	1 5		
Test Boring ended at 25.04 *Water level at 0.3' in a few seconds; a little oil floating on surface of water. Legend: **Water entering Boring @1.5' at fast rate through slag or gravel.	}		1,5	/Γ	7	ļ	
NOTES. TEST BORING ENDED AT 25.04 *Water level at 0.31 in a few seconds; a little oil floating on surface of water. LEGEND: **Water entering Boring @1.51 at fast rate through slag or gravel.	-		12.5	٦			
NOTES. TEST BORING ENDED AT 25.04 *Water level at 0.31 in a few seconds; a little oil floating on surface of water. LEGEND: **Water entering Boring @1.51 at fast rate through slag or gravel.	_			1	٦,	1	
VERY STIFF TO HARD SILTY CLAY, DAMP 20.0 NOTES* TEST BORING ENDED AT 25.0 *Water Level at 0.3' in a few seconds; a little oil floating on surface of water. LEGEND: **Water entering Boring @ 1.5' at fast rate through slag or gravel.	}			/-	5		
NOTES: Test Boring ended at 25.0" *Water level at 0.3' in a few seconds; a little oil floating on surface of water. LEGEND: **Water entering Boring @1.5' at fast rate through slag or gravel.	-		15.0				
NOTES: Test Boring ended at 25.0" *Water level at 0.3' in a few seconds; a little oil floating on surface of water. LEGEND: **Water entering Boring @1.5' at fast rate through slag or gravel.	-		\vdash	ŀ			\ \!
NOTES: Test Boring ended at 25.0" *Water level at 0.3' in a few seconds; a little oil floating on surface of water. LEGEND: **Water entering Boring @1.5' at fast rate through slag or gravel.	[İ	}	
NOTES: Test Boring ended at 25.09 *Water Level at 0.31 in a few seconds; a little oil floating on surface of water. Legend: **Water entering Boring @1.51 at fast rate through slag or gravel.	3.0		47.5				
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*Water Level at 0.3' in a few seconds; a little oil floating on surface of water. LEGEND: **Water entering Boring @ 1.5' at fast rate through slag or gravel.	_						
*WATER LEVEL AT 0.3' IN A FEW SECONDS; A LITTLE OIL FLOATING ON SURFACE OF WATER. LEGEND: **WATER ENTERING BORING @ 1.5' AT FAST RATE THROUGH SLAG OR GRAVEL.	 		22.5				
*WATER LEVEL AT 0.3' IN A FEW SECONDS; A LITTLE OIL FLOATING ON SURFACE OF WATER. LEGEND: **WATER ENTERING BORING @ 1.5' AT FAST RATE THROUGH SLAG OR GRAVEL.			口	\perp	4	1	
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*Water level at 0.31 in a few seconds; a little oil floating on surface of water. LEGEND: **Water entering Boring @1.51 at fast rate through slag or gravel.		St. Teer Section chose on 22 69	25.0	上	᠋	<u> </u>	
LEGEND: **Water entering Boring @1.5" at fast rate through slag or gravel.		*WATER LEVEL AT 0.31 IN A FEW SECONDS	5 ; A L	17	TLE	OILFL	DATING ON SURFACE OF WATER.
A-SPIT SPOON W-SHELBY TURE M-PISTON A-AUGER -ROCK CORF -CALIBRATED PENETROMETER		ND: **WATER ENTERING BORING @1.5' AT	FAST	R۸.	re 7	няо∪а≃	SLAG OR GRAVEL.

W.D. WHILE DRILLING, A.D. - AFTER DRILLING

THE "N" VALUES IN THE STANDARD PENETRATION TEST ARE BLOWS PER FOOT REQUIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER USING A 140 POUND WEIGHT FALLING FREE FOR A DISTANCE OF 30".

	1 E MAIN STREET, GRIFFITH, I	ND.		L	_C	G O	F TES	ST B	ORIN	G NO	<u> </u>	2	_
`	TER LEVEL DATA STARTED 5-19-79		1	.OC	ATI	ION _ 3.	ARKER (IL PR	OPERTY			 	
	FT. W.D. COMPLETED SAME		-			1	38тн S1	REET					_
1.	FT. HR. A.D. DRILLER KOLLASCH						OLTON, CKESSON				<u> </u>		_
	FT. HR. A.D. HELPER HENDERSO FT. HR. A.D. FILE NO. 4535	··-		LIE	ENT		HICAGO			1.0		1	Ì
	GROUND ELEVATION:		ا روا	AND) E	DATA		-14 11	MPRESS		ENGTH	- T. S. I	_
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DEF	·	E		RECOVERY	2	≯ r. ⊁ ⊬			WATER			JID LIMIT	_
	SOIL DESCRIPTION	DEPTH	Ϋ́	3	2	DRY S./FT.	+						<u>+</u>
STRATA		^		REC	٤	UNIT LBS.			NETRATIO	7			_
[S	BLACK SILTY, SANDY CLAY		╁	7	1		10) <u> </u>	0 3	0 4	0 5	<u> </u>	<u> </u>
1.0			$\dashv \downarrow$				STRONS	GASO	INE OF	OR IN	SAMPL	#1	\vdash
7.5	LOOSE BROWN SILTY, CLAYEY SAND STREATS		1/1	1	1			6	P			<u>}</u>	-
5.0	SAND, MOIST LOOSE BROWN MEDIUM TO COARSE SAND WIT	2.5	Н	\neg	-				ĥ		ļ. [\vdash
-	CH EATT CE OWNER OF THE OWN TEE THE T		\Box	_			STRONG	GASO	NE O	OR: IN	SAMPLI	#2	-
5	VERY LOOSE BROWISH-GRAY FINE SAND, SOME ORGANIC, WET	-	1/1	- 2	2		🔶					-	
	LOOSE GRAY COARSE SAND WITH SOME SHAL	50	H	7					ŀ				
5.5	VERY LOOSE TO LOOSE GRAY SILTY						STRONG	TO 5	LIGHT	SASOLI	NE ODO	R.	
F	FINE SAND, WET	-	1/1	- 3	3				N SAMP				\vdash
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3.0		-	1]		=
F	VERY LOOSE GRAY FINE TO COARSE		Π	į	4		ST. I CH	GASO	INE	OR IN	SAMPL	£ #4	F
	SAND WITH TRACES OF SILT AND	10.0	U	İ					"	ľ			
11.0	LENSES OF GRAY CLAY AND TRACES OF FINE GRAVEL, WET	F10.0					SLIGHT	GASOL	NE OD	pe in :	 Sample	#5	
11.5	SOFT GRAY SILTY CLAY, TRACES ORGANIC (SHELLS), WET		П	٦,	_		\oplus			Ø			7
-	(SHELLS), WET		1/1	7	5		公		İ	9			+
ļ .	MEDIUM-STIFF GRAY CLAY WITH	H2.5		ŀ	- }		1			-			F
 	TRACES OF SHALE AND FINE		H	\dashv		•	GASOU	IE ODO	I -Z		CEABL	EIN	Ė
	GRAVEL, MOIST]/	┧,	6				(3)	JAMP] "-0		F
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19.0	VERY STIFF GRAY CLAY WITH TRACES	<u> </u>	1/1		7			$\frac{1}{}$	(S)		ŀ		t
-	OF SHALE AND FINE GRAVEL, DAMP	20.0	H									}	F
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NOTE	S: Test Boring ended at 25.0'												•
LEGE	ND:	•	_			•							
🛛 -	SPLIT SPOON, SPELBY TUBE, SPISTON	•	Δ.	- AUG	GEA	. 🛮	- ROCK CO	RE,	O-CAL	IBRATED	PENETRO	METER.	
Ĭ	WHILE DRILLINGA.D AFTER DRILLING												
THE "	N" VALUES IN THE STANDARD PENETRATION TEST AP	E BLOV	WS F	PÉR	FO	OT RÉQUI	ŘEĎ TO DR	IVE A 2	0.D. SPI	LIT SPOO	N SAMPL	ER USIN	G

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		TER LEVEL DATA STARTED 5-19-79		1	OCA	ATIO	on B	ARKER OI	L PR	OPERT	Y			\dashv
l	2.0	FT. W.D. COMPLETED SAME		-			1	38TH STR						_
	2-2	FT. 1/4 HR. A.D. DRILLER KOLLASCH FT. HR. A.D. HELPER HENDERSO			115	NT		DLTON, 1			MPANY			-
7		FT HR. A.D. FILE NO4685						CAGO HEI						_
ł	Ŧ	GROUND ELEVATION:		S/	MP	LΕ	DATA	UNCONFINI	ED CO	DMPRES	SIVE ST	RENGTH	- T. S.	F.
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		SOIL DESCRIPTION	DEPTH	띰	RECOVERY	N OF	UNIT DRY W LBS./FT. ³	+	MII 76	WAIE	-G		:	~. -+:
ł	STRATA	·	DE			2	LBS.	STANDAR	D PE	NETRAT	ION TES	T - "N"	VALUE	s
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7	LEGE		ľ				777			~				
	∠] -s	PLIT SPOON, STELBY TUBE, -PISTON	. [Δ)	AUG	ER	. //	- ROCK COR	Ε,.	⊕.cv	LIBRATED	PENETRO	METER	

W.D.- WHILE DRILLING . .A.D. - AFTER DRILLING

THE "N" VALUES IN THE STANDARD PENETRATION TFOT ARE BLOWS PER FOOT REQUIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER USII

THE "N" VALUES IN THE STANDARD PENETRATION TEST ARE BLOWS PER FOOT REQUIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER USING A 140 POUND WEIGHT FALLING FREE FOR A DISTANCE OF 30".

		EET, GRIFFITH,			L	og o	F TE	ST B	ORING	NO	10_	
WA 2.0	TER LEVEL DATA _FT. W.D.	STARTED 5-18-79 COMPLETED SAME		L(DCA		138тн S					
	_FT1.4 HR. A.D. _FT24 HR. A.D. _FT HR. A.D.	DRILLER KOLLASCH HELPER HENDERSC FILE NO. 4685		CI	IEN	IT MCKE	ESSON C		DIS L COMPA ILLINO			•
-	GROUND ELEVATIO	N:		SA	MPL	E DATA	UNCONF	INED CO	MPRESSIV	E STREN	GTH - 1	r. s. f.
STRATA DEPTH		ESCRIPTION	ОЕРТН		NUMBER	1	PLASTIC	.O 2. LIMIT %		NTENT %	5.0 Liquid L "N" VA	+
1.2	BLACK SILTY TOP	SOIL WITH BRICKS,		İ	ž	5 -	1	0 20	30	40	50	60
-	MEDIUM BROWN FI	NE TO MEDIUM SAND	- 2.5	1	1							
3.0 4.8 5.0	VERY LOOSE BROW	N FINE TO MEDIUM		/	2		4					- - - -
5.0	VERY LOOSE RE SAND, TRACES S TRACE CLAY B	DDISH-BROWN COARSE SHALE & FINE GRAVEL INDER	5.0						Ġ.	a		
	VERY LOOSE GRA	Y SILTY FINE	- 7.5	<u>/</u>	4			•	*/*/			
12.5			12.5	1	5			Ğ				
	Stiff GRAY CLA OF SHALE AN	Y WITH TRACES D FINE GRAVEL	-15.0-		6			0	•			- - - -
18.0			47.5-									
<u> </u>	VERY STIFF GRA		-20.0	/	<u> </u> 7							
		* .	22.5		8							<u>}</u>
	S: TEST BORING GASOLINE ODOR WA	ENDED AT 25.0' S FOUND IN SOILS EV	25.0 VEN T	нэц Ц	јен	THÉRE	IS WET	SAND.	Тніѕ	SAND IS	EXTRE	
LEGE		HELBY TUBE ,		A -	AUGE	R. 🛛	- ROCK C	ORE,	- CALIB	RATED PE	NETROMET	ER

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THE "N" VALUES IN THE STANDARD PENETRATION TEST ARE BLOWS PER FOOT REQUIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER USING A 140 POUND WEIGHT FALLING FREE FOR A DISTANCE OF 30".

1501 E. MAIN STREET, GRIFFITH, IND.				İ	LC	OG O	F TES	ST BO	DRING	NO.	11	
	ATER LEVEL DATA STARTED 5-18-79		╁,	00	· A T	ION	BARKER	011 P	ROPERTY			
4.	O FT. W.D. COMPLETED SAME						138тн :	STREET				
DRY	FT. 1/4 HR. A.D. DRILLER KOLLASCH		-			1. 16	DOLTON	<u>, [LL1</u>	NOIS			
<u>} - !</u>	FT. 24 HR. A.D. HELPER HENDERSO	-N	C	LII	EN.				L COMPA			
	FI. A.D. FILE NO.								MPRESSIV		NCTH -	TSE
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님		r		≿∣	2	γ ¥ 7.	PLASTIC I	0 2. LIMIT %	O 3.0 WATER CO			6.0 LIMIT %
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STRATA DEPTH		۵	F	ы Ш	NUMBER	UNIT (LBS.,	STANDA	RD PEN	ETRATION	TEST	- "N"	VALUES
<u>s</u>		-	-	~	-	5	10	20	30	40	50	60
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}	MEDIUM TO STIFF BROWN CLAY IN SEAM	-					4	⊕ ø	l	[-
F	GRAY SANDY CLAY IN SEAMS	2.5	<u>/</u>	1			$ \ $	\'\				-
F								V			1	
4.0]					(E	}		<u> </u>
Ŀ	STIFF BROWN AND GRAY STREAKED	-50-	冮	7			/		7		ļ	
}	SILTY CLAY, LENSES OF LOOSE						1 / [i			-
ţ	BROWN AND GRAY SILT WITH SOFT		1	٦					do l			
F	TO MEDIUM SEAMS OF WET SILT		//-	ㅓ			1		/			
3.5	FROM 6.0' TO 7.0'	7.5	П	ļ							j	
[3.7	STIFF GRAY CLAY WITH TRACES OF		1	\dashv		•					1	
F	SHALE AND FINE GRAVEL		//	ㅓ			1 [77 "	1	1	İ	-
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F.,	VERY STIFF GRAY CLAY WITH TRACES		/	$oldsymbol{ol}}}}}}}}}}}}}}}$		[3	7	O i		. [
}	OF SHALE AND FINE GRAVEL	20.0	Н]		ŀ		/		}
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<u>L</u> ,			Ц					[]	\ <i> </i>	/	(
24.	MEDIUM TO DENSE GRAY CLAYEY SILT	+	1/])		}
25.		25.0	V		L	L	1	<u> </u>	L <u>_</u>			
רסא ני	ES: Test Boring ended at 25.0' No gasoline odor was found in t	HF c	٠.				4					
LEG	END:					_						
	-SPLIT SPOON, To SHELBY TUBE, TO SPISTON	,	<u>A</u>] -	· AU	JGE	R, 🛛	- ROCK CO	ORE,	-CALIB	RATED P	ENETRON	ETER
W.	D. WHILE DRILLING . A.D AFTER DRILLING											

THE "N" VALUES IN THE STANDARD PENETRATION TEST APE BLOWS PER FOOT REQUIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER USING A 140 POUND WEIGHT FALLING FREE FOR A DISTANCE OF 30".

	SALISBURY ENGINEERING INC 1501-E. MAIN STREET, GRIFFITH, IN						OG O	F TI	EST	В	ORIN	S NO.	1	2
			IND.	╀					Ev 7					<u> </u>
	FT. W.D.	STARTED 5-31-79		4	.OC	ΑT					EST BOF	RING		~~~~~~
		DRILLER KOLLASC	Н	-		-			N, IL					
	• •	HELPER HENDERS		c	LIE	N'	r_Mc	Kesso	N CHE	241	CAL CO	PANY	··	
	FT HR. A.D.	FILE NO. 4685		-			Сн	ICAGO	HEIG	HT	s, ILLI	NOIS		
Ŧ	GROUND ELEVATIO	N:		s	MP	LE	DATA	UNCO	FINED	co	MPRESSI	VE STR	ENGTH	- T. S. F.
ОЕРТН			<u> </u>	١	اح	_	¥ n		1.0	2.				6.0
0	SOUL D	ESCRIPTION	ЕРТН	ш	E E	BE	DRY /FT.	PLAST	IC LIMIT	% .	WATER C	ONTENT 9	6 LIQ	UID LIMIT %
STRATA		PTION OF SOILS BY	l ä	TYPE	ECOVERY	NOMBE		STAN	DARD	PÈÑ	E TRATIO	TEST	- "N"	VALUES
STR	DRILL CREW)] -]		E.		UNIT		10	20				50 60
_	LOOSE BLACK SAT	NDY SILT, TRACES OF		1	十		NOTE:	AL						LIENT'S
-		ACES OF RUBBLE	\vdash	-	ᆗ.	ا ر	-	I _	REPR	ESE	NTATIL			
	(FILL)			Λ					DRIL	LIN	G .		ł	
- -5.0		•	2.5	4		-								-
	SOFT BLACK AND	DARK BROWN SILTY			_	-								
	CLAY (HAS GASOL	INE ODOR),		Λ	- 1	2		4			•			-
	(FILL), MOIST	TO WET	-50-	4	7	4								
5-5	MEDIUM TO VERY I	LOOSE RUBBLE WITH	+			•								
	WATER (CHEMICAL	_		7	7	3	-	1		\				
-	(FILL), WET	·		∐				ŀ		_				-
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9-5				/ŀ	4	4	2	\forall $\%$						1 <u> </u>
-		RAY STREAKED WITH	10.0	+		-								
-	TRACES OF BLAC	JK GLAY		_				\	\bigvee					
12.0	•			Λ		5	,-T	4	\oplus					! <u>E</u>
	STIFF GRAY, STRE	AKED WITH TRACES OF OF BROWN FINE SAND SHALF & FINE GRAVEL	12.5	4					Ţ					F
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NOTE	TEST BORING	ENDED AT 25.0'												
LÈGE														
_		ELBY TUBE .	, [٦.	·AUG	BEF	. 7	- ROCK	CORE.		- CALI	BRATED	PENETRO	METER
		A.D AFTER DRILLING	٠. د	_			· W//		•		y -			

THE "N" VALUES IN THE STANDARD PENETRATION TEST APE BLOWS PER FOOT REQUIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER USING A 140 POUND WEIGHT FALLING FREE FOR A DISTANCE OF 30".

APPENDIX II-B-2
1981 INVESTIGATION



SALISBURY ENGINEERING INC.

P.O. BOX 270 • 1501 E. MAIN STREET, GRIFFITH, INDIANA 46319

GRIFFITH PHONE (219) 924-6690 CHICAGO PHONE (312) 375-9092

Hovemer 9, 1981 File 5692

HcKasson Chemical Company 500 Hunter Drive Oakbrook, Illinois 60521

ATTENTION: Mr. E. C. (Bob) Hagel

Operations Hanager

Subject: Subsurface Exploration

McKesson Chemical Plant 633 East 133th Strent Dolton, Illinois

Gentlemen:

Enclosed is our report on the subsurface exploration for the proposed additions to McKesson Chemical Plant location at 633 East 138th Street, Dolton, Illinois. This work was completed in accordance with authorization given by Mr. Nagel on October 4, 1931.

After asking a study of the soils and estimated structural loads, we conclude that stiff to very stiff brown to brown and gray silty clay and loose to medium-dense sand encountered underlying 1.0 to 4.0 foot thick layer of mixed fill, are considered suitable for a safe bearing pressure of 3000 psf. For the recommended bearing value, the enticipated sattlement is within tolerable limits.

The general reader is directed to the conclusions and recommendations which subscribe the main points at this site. Details of the exploration and are described in the body of the report which serves as a technical record that will be most pertinent to the architect, designer, and field engineer. The appendix contains information to be used as reference and discusses standard engineering tetails.

The samples will be retained for thirty days and then disposed of, onless you notify us as to their disposition.

We appreciated the opportunity to be of service to you and trust that our work is in order. If there are any questions about this report or if we may be of

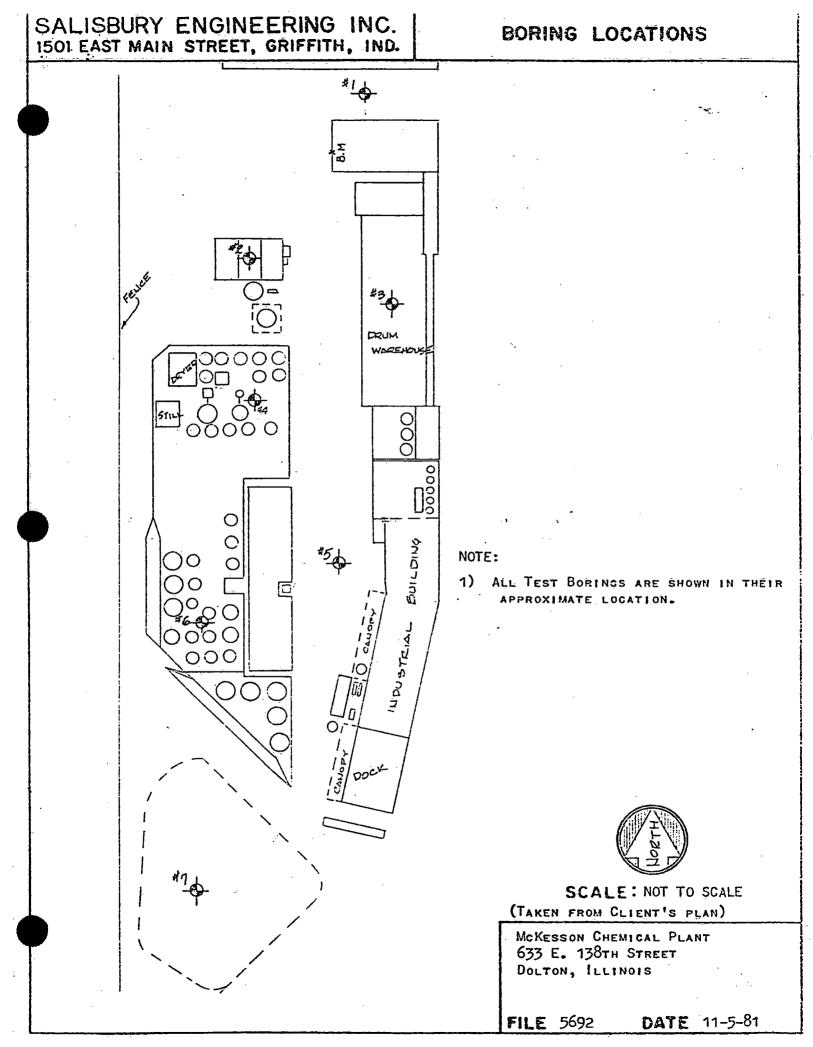
PENETRATION TEST BLOW COUNTS FOR ALL SAMPLES, UNCONFINED COMPRESSIVE STRENGTH OR PENETROMETER READINGS, AND MOISTURE CONTENTS FOR ALL COHESIVE SAMPLES. GROUND WATER LEVELS AS MEASURED IN THE TEST BORINGS ARE ALSO INDICATED ON THE PROFILE.

THE LOGS AND THE SOILS PROFILE SHOW THAT THE UPPER 1.0 TO 4.0 FEET OF SITE IS COVERED WITH LOOSE TO DENSE MIXED FILL MADE-UP OF TOPSOIL, STONES, CINDER, SLAG, BRICKS AND SAND. UNDERLYING THIS IN BORINGS NO1. AND NO. 2, LOOSE TO MEDIUM-DENSE BROWN SAND WAS FOUND.

UNDERLYING AFOREMENTIONED LAYERS, STIFF TO VERY STIFF BROWN TO BROWN AND GRAY SILTY CLAY WAS FOUND. THIS WAS UNDERLAIN BY STIFF TO HARD GRAY SILTY CLAY. BORINGS NO. 4 THROUGH 7 WERE TERMINATED IN THIS SILTY CLAY LAYER. IN BORING NO 1, AT THE TERMINATION DEPTH, HARD GRAY CLAYEY SILT WAS FOUND. BORINGS NO. 2 AND NO. 3 WERE TERMINATED IN A LAYER OF DENSE GRAY SILT. ALL THE TEST BORINGS WERE TERMINATED 25 FEET BELOW PRESENT GROUND LEVEL IN THIS SILTY CLAY LAYER.

GROUND WATER

THE WATER LEVEL READINGS TAKEN AT BORE HOLES DURING AND AFTER
DRILLING ARE SHOWN ON BORING LOGS AND SOILS PROFILE. THE INITIAL
WATER LEVEL READINGS INDICATE THAT IN BORINGS NO. 1 THROUGH 3, AND
7, THE GROUND WATER WAS FOUND IN THE UPPER LAYERS OF MIXED FILL AND
SAND. IN BORINGS NO. 4 THROUGH 6, THE GROUND WATER WAS NOT FOUND
DURING AND AFTER DRILLING. THE BORE HOLES HAVE BEEN EXTENDED
PRIMARILY THROUGH COHESIVE SOILS WHICH REQUIRE A RELATIVELY LONGER
PERIOD FOR THE WATER TO ATTAIN EQUILIBRIUM CONDITIONS INDICATING _____



SALIDBURY ENGINEERING INC.
1501 EAST MAIN STREET, GRIFFITH, IND.
Griffith Bhone
(219) 924-6690

Chicago Phone
(312) 375-9092

GENERAL NOTES

IN ORDER TO PROVIDE UNIFORMITY THROUGHOUT OUR PROJECTS, THE FOLLOWING SYSTEM HAS BEEN ADOPTED TO DESCRIBE EACH SOIL SAMPLE. ROCK, SHALE AND OTHER MATERIALS WILL BE DESCRIBED IN DETAIL AS ENCOUNTERED.

CONSISTENCY OF COH	ESIVE SOILS	RELATIVE DENS	VE DENSITY OF GRANULAR SOILS				
UNCONFINED COMPRESSIVE STRENGTH, Qu, TSF	CONSISTENCY	"N" VALUE *	RELATIVE DENSITY				
< 0.25	VERY SOFT	0 - 3	VERY LOOSE				
0.25 - 0.49	SOFT	4 - 9	LOOSE				
0.50 - 0.99	MEDIUM	. 10 - 29	MEDIUM				
1.00 - 1.99	STIFF	30 - 49	DENSE				
2.00 - 3.99	VERY STIFF	50 - >	VERY DENSE				
4 00	HARD	}	•				

*NUMBER OF BLOWS PER FOOT REQUIRED TO DRIVE A 2" O.D. SPLIT-SPOON SAMPLER USING A 140 LB. WEIGHT FALLING FREE FOR 30".

COLOR - AS DETERMINED ON THE FRESH MOIST SAMPLES

PREDOMIN	ATE COLORS	SHADES	MODIFYING ADJECTIVES
BLACK	YELLOW	ĪІСНТ	VARI - COLORED
BROWN	RED	DARK	STREAKED
GRAY	BLUE	•	MOTTLED

SOIL IDENTIFICATION TERMINOLOGY

	GRANULAR SOILS	COHESIVE SOILS							
COMPONENTS	SIZE RANGE	DESCRIPTIVE TERM	PLASTICITY INDEX						
BOULDERS	OVER 8 INCHES	CLAY OR ORGANIC CLAY	30						
COBBLES	8 INCHES TO 3 INCHES	SILTY CLAY OR ORGANIC SILTY CLAY	8 <i>-</i> 30						
GRAVEL	3 IN. TO [#] 4 SIEVE (4 75 mm)	INTERNEDIATE SOILS							
SAND	#4 SIEVE TO #200 SIEVE (0.075 mm)	CLAYEY SILT	4 - 7						
SILT	PASSING #200 SIEVE (0.075 mm)	SILT	0 - 3						

ESTIMATED PROPORTIONS OF MATERIAL SIZE BY WEIGHT IN PERCENT

TRACE	1 - 10	
LITTLE	10 - 20	,
SOME	. 20 - 35	
AND	35 50	

WATER LEVELS ARE THOSE OBSERVED WHEN BORINGS WERE MADE, OR AS NOTED. POROSITY OF THE SOIL STRATA, VARIATIONS OF RAINFALL, SITE TOPOGRAPHY, ETC., MAY CAUSE CHANGES IN THESE LEVELS.

SALISBURY ENGINEERING INC. UNIFIED SOIL CLASSIFICATION SYSTEM 1501 EAST MAIN STREET, GRIFFITH, INDIANA ASTM D 2487-69 (Reapproved 1975) Chicago Phone Griffith Phone & D 2488-69 (Reapproved 1975) (312) 375-9092 (219) 924-6690 GROUP TYPICAL NAMES MAJOR DIVISIONS CLASSIFICATION CRITERIA SYMBOLS C_u=D₆₀/D₁₀GREATER THAN 4; C_z= (D₃₀)² D₁₀ × D₆₀ WELL-GRADED GRAVELS AND BETWEEN 1 AND 3 G W GRAVEL-SAND MIXTURES. fraction GRAVE LITTLE OR NO FINES 7 CLEAN C00196 8 6 4 6 POORLY GRADED GRAVELS AND NOT MEETING BOTH CRITERIA FOR GW GRAVEL-SAND MIXTURES, LITTLE G P GRAVELS z OR NO FINES ᆫ 50:lit. 5 No. 200 sieve ŝ 7 BOLB FINES 9 ATTERBERG LIMITS PLOT BELOW "A" LINE SILTY GRAVELS, GRAVEL-SAND-SILT 5 SW, SP SM, SC Classifications of G M MIXTURES OR PLASTICITY INDEX 50 % or m retained ATTERBERG LIMITS PLOTTING ш ¥ | | **LESS THAN 4** IN HATCHED AREA ARE 0 SOIL BORDERLINE CLASSIFICATIONS 4 REQUIRING USE OF DUAL PERCENT GRAVELS 5 ATTERBERG LIMITS SYMBOLS - GRATINED CLAYEY GRAVELS, GRAVEL-SAND-PLOT ABOVE "A" LINE GC S¥, retoined CLAY MIXTURES AND PLASTICITY INDEX GREATER THAN 7 9 ö ₹8 WELL-GRADED SANDS AND COAR.SE-an 50% r SANDS 9 Cu=D60/D10 GREATER THAN 6; Cz=D10 x D60 GRAVELLY SANDS, LITTLE OR SW BETWEEN 1 AND 3 fraction NO FINES 200 sieve than BASI slave Z Z POORLY GRADED SANDS AND 600786 CLE GRAVELLY SANDS, LITTLE OR NOT MEETING BOTH CRITERIA FOR SW SP 200 ŝ 9 10 V B. Pose 7 CLASSIFICATION ATTERBERG LIMITS \$10d FINES % 12% Pass k PLOT BELOW "A" LINE 30 SM SILTY SANDS, SAND-SILT MIXTURES OR PLASTICITY-INDEX **4** ATTERBERG LIMITS PLOTTING % ŝ LESS THAN 4 than i. IN HATCHED AREA ARE than HLIX BORDERLINE CLASSIFICATIONS 808800 Less than ATTERBERG LIMITS REQUIRING USE OF DUAL PLOT ABOVE "A" LINE CLAYEY SANDS, SAND - CLAY ٥ SYMBOLS SANDS SC AND PLASTICITY INDEX MIXTURES Mor GREATER THAN 7 INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY MI 60 888 FINE SANDS CLAY For classification of fine-grained 5 soils and fine traction of INORGANIC CLAYS OF LOW TO 50 course - grained soils. 20 % MEDIUM PLASTICITY, GRAVELLY CL Atterbarg Limits plotting in CLAYS, SANDY CLAYS, SILTY CLAYS, SOILS . 200 sleve CH hatched area are borderline LEAN CLAYS classifications requiring use Liquid limit INDE of dual symbols. Equation of A-Line: PI = 0.73 (LL-20) ORGANIC SILTS AND ORGANIC OL SILTY CLAYS OF LOW PLASTICITY ICITY passes No. GRAINED PLAST! % OH and MH INORGANIC SILTS, MICACEOUS OR 20 MH DIATOMACEOUS FINE SANDS OR BOLE CLAYS ž than SILTS, ELASTIC SILTS CI 6 greater A'N D % 10 INORGANIC CLAYS OF HIGH СН PLASTICITY, FAT CLAYS ML and O v Liquid limit SILT 0 100 ORGANIC CLAYS OF MEDIUM o 10 20 30 50 60 70 80 90 ОН TO HIGH PLASTICITY LIQUID LIMIT PEAT MUCK AND OTHER HIGHLY VISUAL MANUAL IDENTIFICATION HIGHLY ORGANIC SOILS PT ORGANIC SOILS * Based on the material passing the 3 inch (75 mm) sieve.

2.0	FT. W.D.	STARTED 10-9-81 COMPLETED SAME		-		6	33 Eas	т 138т	ICAL PI			
	_FT HR. A.D. _FT HR. A.D.				IFN	T McK	OLTON,	CHEMIC	OIS AL COM	PANY		
	FT HR. A.D.	· · · · · · · · · · · · · · · · · · ·			. 1 6.13		BROOK,					
	GROUND ELEVATIO	1	<u> </u>	SAI	MPL	E DATA	UNCONF	INED CO	MPRESS	VE STR	ENGTH -	- T. S. I
DEPTH				∏ ,		WT.	1				.0 5.	
<u>8</u>	SOU D	ESCRIPTION	DEPTH	TYPE	NUMBER	DRY /FT.	PLASTIC	LIMIT %	WATER	CONTENT 9	& LIQU	ID LIMIT
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	L .	GREENFINE TO MEDIUM		1	1		4	3				
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• >	STIFF BROWN AND	GRAY STREAKED		╁	1		1		1			
	WITH BLACK, SILT	Y CLAY, TRACES OF		! / -	2		1 4	IΨ	€)			
-5	FINE GRAVEL (C	CL)	-50-	Н					`\			
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	FINE GRAVEL AN			1/	4				5		!	
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F	13.0		· · · · · · · · · · · · · · · · · · ·	12.5	П					\ \ i				
ł		VERY STIFF GRAY	SILTY CLAY,	-	 	\dashv		•		1				-
		TRACES OF FINE	GRAVEL AND		I/L		6			$ \Delta $!	Ī
ŀ		SHALE		-15.0-	П					1	\mathcal{H}			
t	·	(CL)		-						\ -1				-
F	1					-				\ \ 1			i	
ł	17.5				1 1	ı				\				-
L		VERY STIFF TO	HARD GRAY SILTY	17.5						/.				t
-	•		OF FINE CRAVEL		\sqcup	_					$\sqrt{}$. [
ŀ		AND SHALE			I/I					d	\wedge	\Box		-
L		(CL)		20.0		┪	7		ļ	l i		Ú		
+	20.5	David and a	TRACEC OF	1-070			į		1	1				}
L	·	FINE GRAVEL A	WITH TRACES OF		1	1			1	· /			•	F
ŀ			IID SHAEE			ı	.			l .'				[
1		(ML)	·	22.5	H	1				/				}
					Ц	╛			}	/				
-				<u> </u>	1		8			33		\ \ \ \ \		F
5	5.0	TEST BORING END	ED AT 25.01	250	1/	4				الم	{	Δ		ŀ
f			OLE CAVED-IN AND	DRY T	0 2	22.	.oʻ	' AT C	OMPLET	10N 01	DRILL	NG.		
ļ														
1	LEGE	ND:	m		-			erro.	ı		_			
			IELBY TUBE ,	Ν, [۸] .	AUC	GEF	٠. 🏻	- ROCK C	ORE,	-CALI	BRATED P	ENETROME	ETER
1	W. D	WHILE DRILLING A	.D AFTER DRILLING								•			
			DARD PENETRATION TEST AT ING FREE FOR A DISTANCE			ER	FO	OT REQUI	RED TO DA	RIVE A 2	" O.D. SPL	IT SPOON	SAMPLER	RUSING

150	1 E, MAIN STREET, GRIFFITH, I			L	OG O	F TEST BORING NO3
3.0	FT. W.D. STARTED 10-9-81 FT. W.D. COMPLETED SAME FT. 1/4 HR. A.D. DRILLER KOLLASCH		L(OCA.	6 D	McKesson Chemical Plant 533 East 138th Street Dolton, Illinois
	FT HR. A.D. HELPER SHEFFIELD		CL	IEN	, . 	BROOK, IL
	CROUND ELEVATION: 00 60		П		E DATA	UNCONFINED COMPRESSIVE STRENGTH - T. S. F. 1.0 2.0 3.0 4.0 5.0 6.0
O STRATA DEPTH	SOIL DESCRIPTION	DEPTH	TYPE	NUMBER	UNIT DRY 1	PLASTIC LIMIT % WATER CONTENT % LIQUID LIMIT %
0.8	CINDERS, BRICK, STONE BASE (FILL)		- "	-		10 20 30 40 50 60
- - - - - - - - - -	LOOSE BLACK, BROWN AND GREEN SILTY FINE SAND AND TOPSOIL (SM-OL)	- 2.5	/-	1		
- - -	VERY STIFF BROWN AND GRAY SILTY CLAY (CL)	-50-		2		
7.0				3		
8.5 9.0	STIFF GRAY STREAKED WITH BLACK AND BROWN SILTY CLAY, TRACES OF FINE GRAVEL (CL) VERY STIFF GRAY SILTY CLAY, LENSES OF FINE SAND AND GRAVEL (CL)	7.5				/ /
L	STIFF GRAY SILTY CLAY, TRACES OF FINE GRAVEL AND SHALE (CL)	-10.0₌	<u>/</u>	4		
	STIFF GRAY SILTY CLAY, TRACES OF FINE GRAVEL AND SHALE (CL)	12.5		5		
		-15.0-	/	6	-	
-						
17.5 - -	HARD GRAY SILTY CLAY, TRACES OF FINE GRAVEL AND SHALE (GL)	17.5-		7		
20.5	Dense gray silt, traces of fine gravel (ML)	20.0				
	TEST BORING ENDED AT 25.01	25.0		8		
W. D	ND: SPLIT SPOON, S-SHELBY TUBE, -PISTON - WHILE DRILLING, .A.D AFTER DRILLING	E BLOW	/S PE			- ROCK CORE, - CALIBRATED PENETROMETER SIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER USING

(n (n ()

		LISBURY ENG LE MAIN STREE					LC	og o	F TES	ST B	ORING	NO.	4		-
ŀ		- /		0-22-81	WD.	10	CAT	ION M	CKESSON	Снем	ICAL PLA	NT			\dashv
Ì		31		AME			CAI		33 E. 1						_
			ILLER K	COLLASCH		-		• • • • • • • • • • • • • • • • • • • •	OLTON,						-
1		FT HR. A.D. HE		HEFFIELD 692		CL	EN'		BROOK,		AL Co.				- [
ł		GROUND ELEVATION:		7		500	DL C	E DATA			MPRESSLV	E STRE	NGTH -	T. S. F.	4
1	ОЕРТН	GROUND ELEVATION.	100.20		ſ				1.0		.0 3.0				-
l	DE				프	E E	3E.R	DRY W			WATER CO			LIMIT	%
l	ATA	SOIL DESC	RIPTION		EPT	<u>ام</u>	UME	. DR S./F	#	90 951	VETRATION	TECT		/A 11FS	늬
1	STRATA		•		١	RECOVERY	Z	UNIT LBS.	10		0 30		50		-
Ì	0.5	STONE	(2.1)												日
Ì	_	MEDIUM BLACK TOPS	oir (OL)	'		+	1			•					口
ł	<u>-</u>				<u> </u>	/				/ 2.		-			\forall
I	3.5				2.5						\ \	1			П
l		STIFF TO VERY STI	FF BROWN	AND		+	_		1 <i>X</i>	, <u> </u>	\ (3)				口
l	-	GRAY STREAKED S	ILTY CLAY	•		/ -	2		1 4	, Y					Н
ſ	-	(CL)			-50	٦			1 /		1 1		- [\exists
Ì	6.5					\top	_								口
ł	-	STIFF BROWN AND G	RAY STREA	KED	7.5	/}─	3		分	\bigcirc					ᆸ
	-	(32,													Н
	, -					1	4	:	1 1	1	T				
					10.0				1 4	<u>.</u>					
7	0.5	VERY STIFF GRAY S	ILTY CLAY		70.4				1.1	/, /	!!!!				\exists
I	-	TRACES OF SHALE		-		$/\!\!\!/$				λ	6		İ		\vdash
	-	(CL)			12.5	<u>/</u> -	5			T	7				口
	-		·												日
	-					/	6		1.	\triangle	6				Н
Ì	-	÷			-15.0-	4	В								\Box
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	-				17.5					- 1	\setminus		İ		Н
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ŀ	-						7			ϕ	4	\Diamond			
	-				20.0	4			1	i		X			Н
I	22.0	HARD GRAY SILTY C		70.05						ſ		'			П
I	- -	SHALE AND FINE								1					
ł	-				22.5					1	\	ļ	V		
ŀ	-					_	+			1	\				
	- 55 N	TEST BORING ENDED	.T 25 0!		25.0	/L	8			0	4			\bigcirc	П
		SI SURFACE WATER EN			1250)	<u></u>		L			<u> </u>				<u>ب</u>
7	•									-					. !
	LEGE!	ND: SPLIT SPOON, 🙀 -SHELE	Y TUBE .	-PISTON		A - A	UGE	R, 💯	- ROCK CO	RE.	- CALIB	RATED PE	ENETROM	ETER	
		WHILE DRILLINGA.D.				``` ب	_	- 7//	a	- •	J				
	THE "1	N" VALUES IN THE STANDAR POUND WEIGHT FALLING	D PENETRATI	ION TEST ARE	BLOW 0F 30 "	S PE	R FO	OT REQU	IRED TO DR	IVE A 2	O.D. SPLI	T SPOON	SAMPLE	RUSING	,

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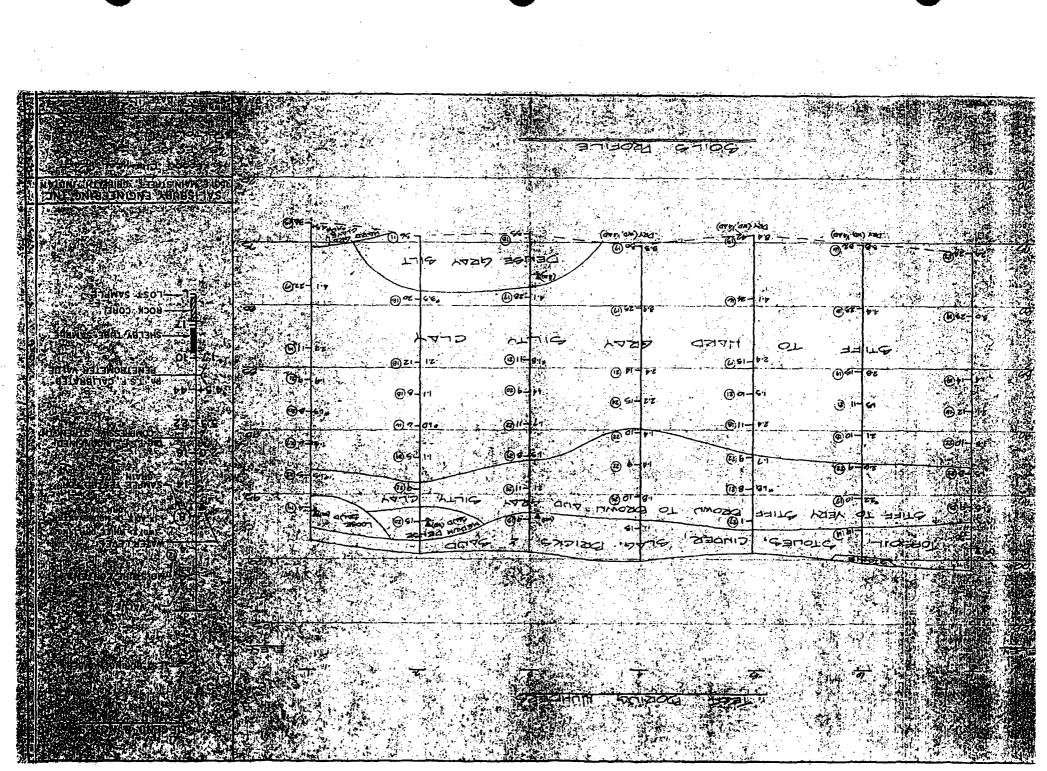
	LIGBURT ENGINEERING II 1 E MAIN STREET, GRIFFITH,			L	OG O	F TEST BORING NO5
WA	FT. W.D. STARTED 10-22-81 COMPLETED SAME		L	OCA.	TION M	ACKESSON CHEMICAL PLANT
	FT. 1/4 HR. A.D. DRILLER KOLLASCH FT. HR. A.D. HELPER SHEFFIEL FT. HR. A.D. FILE NO. 5692		CI	IEN	T McK	COLTON, ILLINOIS KESSON CHEMICAL CO. KEROOK, IL
I	GROUND ELEVATION: 99.60		SA	MPL	E DATA	UNCONFINED COMPRESSIVE STRENGTH - T.S.F.
STRATA DEPTH	SOIL DESCRIPTION	DEPTH	TYPE	NOMBER	UNIT DRY WT. LBS./FT. 5	1.0 2.0 3.0 4.0 5.0 6. PLASTIC LIMIT % WATER CONTENT % LIQUID LIMIT * **TANDARD PENETRATION TEST - "N" VALUES 10 20 30 40 50 60
1.0	0.3 ASPHALT, 0.7 SLAG	-		1		
-2.2	MEDIUM BLACK, TRACE BROWN TOPSOIL AND FINE GRAVEL (OL-GP)		\overline{F}	7		
-	STIFF BROWN STREAKED WITH GRAY, SILTY CLAY, TRACES OF SHALE AND FINE GRAVEL (CL)	- 2.5 - 5.0		2		
- - - - -	Stiff to very Stiff GRAY CLAY,	- 7.5	/-	3		
	TRACES OF SHALE AND FINE GRAVEL (CL)	-10.0	/	4		
- - - - - - - - - - - - - - - - - - -	VERY STIFF GRAY CLAY, TRACES OF	12.5	<u> </u>	5 6		
- - - 18.0	SHALE AND FINE GRAVEL (CL)	15.0 17.5	<u>/ </u>			
- - - - - -	HARD GRAY VERY SILTY GLAY, TRACES OF SHALE AND FINE GRAVEL (CL)	20.0	1	7		
		22.5	1			8.4
	TEST BORING ENDED AT 25.01	25.0	1	8	<u>L </u>	Δ 0.4
W.D.	ND: SPLIT SPOON, SO - SHELBY TUBE,	E BLOW	— Š PE			- ROCK CORE, - CALIBRATED PENETROMETER DIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER USING

	LISBUKY ENGINEERING IN 1 E. MAIN STREET, GRIFFITH, I			Ł	_C)G 01	FTE	ST B	ORING	NO.	· 	6
,WA	FT. W.D. STARTED 10-22-81		L	.oc	AT.	10N Mc	KESSON	СНЕМІ 138тн	CAL PLA	ANT		
DRY	FT. 1/4 HR. A.D. DRILLER KOLLASCH				_			ILLING				
	FT HR. A.D. HELPER SHEFFIEL	D	c	LIE	ENT			HEMICA	L Co.			
7	FT HR. A.D. FILE NO		-			OAKE	ROOK,	<u>IL</u>				
×	GROUND ELEVATION: 100.3		SA	MF	<u>, L</u> E	DATA	UNCONF	INED CO	MPRESSI	E STR	ENGTH	- T. S. F.
DEPTH				را≾	œ	¥.		.0 2.				.0 6.0
ā	SOIL DESCRIPTION	EPTH	TYPE	E	NUMBER	DRY ./FT.	PLASTIC	LIMIT %	WATER C	ONTENT 9	6 LIQI	JID LIMIT %
STRATA		06.1	ŢΥ	0][T D 3S./	STAND	ARD PER	ETRATION	TEST	- "N"	VALUES
STR				2		UNIT LBS.	} —	0 2				0 60
0.5	Stone		П	T	\exists		1					F
}	MEDIUM BROWN AND BLACK SILTY	-	1	\dashv			1	004		}		-
E .	SAND AND TOPSOIL (SM-OL)		1/	╝,	1		l .	1 87				
3.0		2.5	Н					X				-
P."	VERY STIFF BROWN AND GRAY SILTY		Ц	4				/ `\			•	
	CLAY (CL)		1/1		2		2	(i)	A			 -
Ł		-50-	⅓	\dashv				\	7		•	
5-5	1	=	11	1			1 /	1	. \			-
Ė	VERY STIFF BROWN AND GRAY SILTY CLAY, LENSES OF GRAY SILT AT		1	┥.	3				771			
-	6.5' + TRACES OF ORGANICS IN SILT LENSES (CL)	<u> </u>	{/ }	નં '	ا د		1 4	1				1 +
L 8.0	SILT TÉNSES (CL)	- 7.5-	H		Ì				[]	ł		
-	STIFF GRAY SILTY CLAY MOTTLED	<u> </u>		-			\	,				
E	WITH TRACES OF BROWN SILT, SHALE AND/OR FINE GRAVEL (CL)		1/1	- [.	4		1 4	Ø 4	$O \mid$			i E
	AND/OR FINE GRAVEL (CL)	-10.Q <u>-</u>	/	7			7.5	٠ - ١				-
7		-					1					
-		<u> </u>	1/		_							
Ł	j.	12.5	V	4	5			RY.				l E
57 5	·	12.5	П	ł						Ì		
53-5	VERY STIFF GRAY SILTY CLAY, TRACES			\dashv						Ì		
F	OF SHALE AND FINE GRAVEL (CL)		/		6			43				
Ė		-15.0-	Н	7				\!				
F			$\ \ $									F
<u> </u>	•	<u> </u>	1 1	İ			}	1				-
18.0		H7.5-	1				1			V		
F	V on the second only on TV or A	 								j		۱· ⊦
F	VERY STIFF TO HARD GRAY SILTY CLA Traces of shale and fine to		17		7			6	λ		\bigcirc	
E	MEDIUM GRAVEL	20.0	V	4				i	T		T	l
£	(CL)	720.0	П		1		1	1			/	
 			H	Ì							/	-
F			1								/	
		22.5	11	1				1	\	//		
F !			\coprod	4			}	'	N	<i>\ </i>		F
E]/[8			6		$\lambda \wedge $		1 +
	TEST BORING ENDED AT 25.0'	25.0	<u>L</u>	1			l	L			<u> </u>	
NOTE	21											
	SPLIT SPOON, 🙎 -SHELBY TUBE, 🔲 -PISTON	. [A -	AUG	GEF	· Ø	- ROCK C	ORE,	O - CALIE	BRATED	PENETRO	METER
1	WHILE DRILLINGA.D AFTER DRILLING											
A 140	N" VALUES IN THE STANDARD PENETRATION TEST ARI Depoyed weight falling free for a distance	E BLOW OF 30'	/S P	ER	FO	QT REQUI	RED TO DI	RIVE A 2"	O.D. SPL	T SP00	N SAMPL	LH USING

	L ISBURY ENGINEERING IN LE MAIN STREET, GRIFFITH, I			Ŀ	OG OI	F TEST BORING NO7
WAT	ER LEVEL DATA STARTED 10-22-81		LC	DCAT		KESSON CHEMICAL PLANT
	FT. W.D. COMPLETED SAME		_			53 E. 138TH STREET
1.	FT. HR. A.D. HELPER SHEFFIEL				- McKE	OLTON, ILLINOIS
	FT HR. A.D. HELPER SHEFFIEL FT HR. A.D. FILE NO 5692	-	Cr	.IEN	-	BROOK. IL
-	GROUND ELEVATION: 100.90		SAI	MPL	E DATA	
ОЕРТН]	,		¥ H	1.0 2.0 3.0 4.0 5.0 6.0
		Ŧ	و ال	NUMBER	<u>></u> .	PLASTIC LIMIT % WATER CONTENT % LIQUID LIMIT %
STRATA	SOIL DESCRIPTION	DEPTH	7 V		DRY	++
E E		0	ا ر] Z	UNIT LBS.	STANDARD PENETRATION TEST - "N" VALUES
S		-	٥	د	5	10 20 30 40 50 60
1.0	SOFT BROWN AND BLACK CLAYEY TOPSOI (FILL)					
] 1	Ì	
+	Dense BRICK (FILL)	\vdash	I	'	}	
3.0		2.5	/ 		1 .	
	LOOSE BLACK TOPSOIL AND FINE GRAVE			_		
4.0	(OL-GM)	 	<i> </i> -	2		
<u>L</u>	STIFF BROWN AND GRAY SILTY CLAY		/	1		
F	(CL)	-50-			· ·	
+ 1			 	+		
t !			<i> </i> -	13		
8.0		7.5	4			
F 0.0		-				
	STIFF GRAY SILTY CLAY MOTTLED		1	٦,		1 1 7 1 1 1 1
}	WITH TRACES OF BROWN SILT,	<u> </u>	V lacksquare	4)	1 4 Q 19 1 1 <u>1</u>
F 1	TRACES OF ORGANIC, SHALE AND	10.0	Н			
E	FINE GRAVEL, LENSES OF GRAY			4		
11.5	MEDIUM SAND AT 9.0'+ (CL)		A	5		
t !		12.5	$ar{U}$	-		
F i	VERY STIFF GRAY CLAY WITH	12.5	-			
†						
	TRACES OF SHALE AND FINE		I/L	<u></u> 6		
- .	GRAVEL (CL)	15.0-	-		1	
į į			1	·		
-		-				
}		17.5-			1	
F		[,,3-			1 .	
-		-	╁	╣.		
L			1/1	7		
, -		20.0	┟┼	7		
}		 		-		
F						
-	,	-			1	
		22.5			1	
-			├	4		
<u></u>			1	8		
	Test Boring ended AT 25.0'	25.0	业	Ⅎ_	<u> </u>	
NOTE	Şı					
LEGE	N n·					
		. 1	A	AUGF	R. Viii	- ROCK CORE CALIBRATED PENETROMETER
1 —	WHILE DRILLING . A.D AFTER DRILLING	• (' ل		<u> </u>	2
1		E BLOW	/S PI	ER F	OOT REQUI	IRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER USING

THE "N" VALUES IN THE STANDARD PENETRATION TEST ARE BLOWS PER FOOT REQUIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER USING A 140 POUND WEIGHT FALLING FREE FOR A DISTANCE OF 30".

r:



APPENDIX II-B-3
1983 INVESTIGATION

	1 E. MAIN STREEL, GRIFFLIN,					KLING					0				
	TER LEVEL DATA STARTED 7/21/83 FT. W.D. COMPLETED Same			.00	AT	ION M	cKesso bserva	n C	hem:	elle 1cai	@ Do	lton	Pla	nt	
	FT. W.D. COMPLETED Same FT. HR. A.D. DRILLER Wandersee		-			D	olton.	n	lin	ois			<u> </u>		
	FT HR. A.D. HELPER Banes		c	LI	EN.	McKe	sson C	hem	ica	1 Co.					
	FT HR. A.D. FILE NO. 6378		.			Dolt	on, IL	ı.				·	·		
7	GROUND ELEVATION: 593.58		SA	M	PL I	DATA	UNCONF	INE	c c	MPRE	SSIVE	STR	ENGT	н - 1	T, S. F
DEPTH		}		_	~	¥T.		.0		.0	3.0	4.		5.0	6
	SOUL DESCRIPTION	ЕРТН	w	E E	BEF	DRY .	PLASTIC	LIM	T %	WATI	ER CON	TENT %	6 L	ן פוט פו	LIMIT
STRATA	SOIL DESCRIPTION	i i	Z	RECOVERY	NUMBER	r DI	STAND	ĀĒŃ	PFI	FTRA	TION	75 57			1 1/5
STR		-		ä	-	UNIT LBS.	l ———	0		0	30	40		50	
0.2			П					Ī			Ť			T	
. 1.0	Slag fill	 	H				l								
-	Brownish-gray clayey sand, some]		- {		}		٠	1		1			
•	fine to medium gravel	2.5	A	į	1		l	}		! . !)			
			1	ļ						}				Ì	
	•	<u> </u>	1	1	Ì		1					ļ		į	
5.0		50	Ц					}				ļ			
	Very loose brown fine to coarse	-30			- {							ł			
	sand and gravel, some clay	-	H	\exists]		į		!	
		77.00]/	į	2		1/18	3''		•		!		!	
		195	1								1	į			
			1				11			Ì		į			
		}	1				11							:	
0.0	(10.0	1	į						1		İ		1	
	Very soft dark brownish-gray		1	}			11				-				
	sandy clay, some fine to		1/1		ļ					}		!			
	medium gravel	 	/	ļ	3		人1/18	9"			į				
		12.5	\Box	Ì	į			İ			!				
		<u> </u>	4	}						[i	İ		•	
			1	j	1		}			1	į	Í			
15.0	<u></u>	15.0]		i					}	}			:	
]	!	1						;				
	Boring ended at 15.0'			1			}			.		ļ			
		17.5-]	;	į			İ				!		:	
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		20.0	1	ļ							ļ	ļ			
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		22.5	1									į			
	From the second		1	}							!			* *	
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		25.0	$\{\ $								i				
NOTE	S:	1230	L				<u> </u>	ــــــــــــــــــــــــــــــــــــــ		l		i		· - عالم ن	
W. D.			_												

	IE. MAIN STREET, GRIFFITH,	HAD.			بال	UNLIN	56							·
	TER LEVEL DATA STARTED 7/22/83		1	LO	CAT	10и	cKerso bserva	n Che	emi	tal G	ompan;	7 7 D	lant	
	FT. W.D. COMPLETED Same FT. HR. A.D. DRILLER Wandersee		ł	_			olton,				DOTE	JII F-	-anc	
•	FT. HR. A.D. HELPER Banes		1		FN	T McKe	sson C	hemi	al	Co.				
	FT HR. A.D. FILE NO. 6378		1			Dolt	on, IL							
	GROUND ELEVATION: 593.56		اد		PI	F DATA	UNCONF	NED	COM	PRESS	LVE ST	RENG	TH -	T
H	GROUND ELEVATION: 23200	1		7		•		.0	2.0		<i></i>	4.0	5.0	
DEPTH		1 =		ER.	ER	Y WT.	PLASTIC				CONTENT			LIMIT
¥	SOIL DESCRIPTION	DEPTH	YPI	0	M	R 7	+				<u></u>			
A A	·	^	-	S E	ž	UNIT DRY WT	STANDA	LRD I						
STRATA	2½" Asphalt	┼	-	-	<u> </u>		1	<u> </u>	20	3	ō	40	50	
1.0	Crushed Slag		1						. }			1	1	
ŀ	Name Joans amountab doubt house		-									1	1	
	Very loose grayish-dark brown fine to medium silty sand	- 2.5-]				ļ					1	ŀ	
-	and gravel, some clay binder	-	1						-				-	
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	WHILE DRILLING , .A.D AFTER DRILLING					•						•		
	I [®] VALUES IN THE STANDARD PENETRATION TEST ARI Pound weight falling free for a distance			PER	FO	OT REQUI	RED TO DA	HVE A	2"	O.D. SPL	IT SPO	ON SA	MPLER	USIN
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		LE. MAIN SIKEEL, ORIFILIA	-سالايا			1001-10	ر س					
		TER LEVEL DATA STARTED 7/23/83		Ti	OCA	TION M	cKesso	n Chem	ical C	ompany		
j		FT. W.D. COMPLETED Same		-		, O	bserva	tion W	ells @	Doltor	Plant	
		FTHR, A.D. DRILLER Wandersee		-		D MaVa	olton,	Tilin	ols TC			
		FT. HR. A.D. HELPER Banes		C	LIE	TOTE	on, IL	nemica	1 00.		- = -	
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	Ξ	GROUND ELEVATION: 593.55	ł	SA	MPI		UNCONF				ENGTH -	
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١	THE "1	N [®] values in the standard penetration test ar:) Pound weight falling free for a distance	E BLOV OF 30	YS P	ER F	OOT REQU	RED TO DE	HVE A 2	O.D. SP	LIT SPOO	N SAMPLE	R USIN

150	OLE. MAIN STREET, GRIFFLIH,	MD.		150	RINL	4						N	ORTH
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	_FTHR. A.D. DRILLERWandersee	<u></u>			D	olton,	<u> 111:</u>	inoi	5				
	FTHR. A.D. HELPERBanes		CL	IEN	McKe	geon C	nemi	car	<u></u>				
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I	GROUND ELEVATION: 593.54		SAI	MPL	E DATA	UNCONF	INED	COM	PRESS	LVE S	TRE	NGTH	-
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	1 E. MAIN STREET, GRIFFITH,	IND.			10	RINO	- <u>)</u>							ÆST
	TER LEVEL DATA STARTED 7/23/83	3	l	LOC	CAT	ION M	сКевв	on	Che	rica.	l Con	pany		
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l	FT HR. A.D. DRILLER Wanderses		-			D ₁	olton	on.		nois				<u> </u>
	FTHR. A.D. HELPER Banes		١	CLI	EN'	McKe	on, I	Chi	emic	al C) .			
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Z	GROUND ELEVATION: 592.49	4	S/	AM	PL		UNCON	FIN	ED C	OMPR	E S S L V	E STR	ENGTH	- T. S.
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1 —	SPLIT SPOON, SHELBY TUBE, TISTON - WHILE DRILLING, .A.D AFTER DRILLING	• 1	<u>ب</u>	AU(G E A		- HOCK C	PHE,	A . CVI	LUNATED I	-ENETHO	-E724
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	N [®] values in the standard penetration test ari) pound weight falling free for a distance (t, R	FQ(JE REQUI	WÊN IN DA	IVE A	z 0.0. SP	LII 37001	JAMPL	ru naik

		I E. MAIN STR	EET, G	KILLIH,	ND.	_1			UNIN						THME	EST.
		TER LEVEL DATA	STARTED	7/26/83		L	-00	CAT	ION M	сКевво	n Che	mical	Compan	y		
		_FT. W.D.	COMPLETE	Same		-	_			bserva olton,			@ Dolt	on P	Lant	<u> </u>
		_FT HR. A.D. _FT HR. A.D.						EN	- McKe	sson C	hemic	al Co.				
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1	_	. WHILE DRILLING			• [<u>.</u>			• 64		- •	1 • • •		•		
}		TVALUES IN THE STAN			BLOW	S P	ER	FO	OT REQUI	RED TO D	RIVE A	2" Q.D. S	PLIT SPO	AZ NO	MPLE	RUSING
ļ	A 140	POUND WEIGHT FALL	ING FREE FO	OR A DISTANCE		. "	,	. •				J	•.•			

	FT. W.D. STARTED 10/5/83 COMPLETED SAME DRILLER WANDERSEE		LOCATION MCKESSON CHEMICAL COMPANY OBSERVATION WELLS, DOLTON PLANT DOLTON, ILLINOIS CLIENT MCKESSON CHEMICAL COMPANY										
	FTHR. A. D. HELPER <u>Banes</u> FTHR. A. D. FILE NO. <u>6378</u>	,	19	CLI	EN		SSON (ICA	L Com	PANY		
I	GROUND ELEVATION: 593.5		S	AM	PLI	E DATA			CO	MPRES	SIVE ST	RENG	TH -
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F- ^	RUBBLE FILL	2.5	A		2						ŀ	ŀ	
3.0	MEDIUM DENSE BROWN SILTY FINE TO			Ц				İ				1	
-	MEDIUM SAND, GRADES TO CLAYEY	 	1/		3								
F	FINE TO COARSE SAND, WITH FINE TO	5.0	И	Ц	ر			17					
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Ø-5 W.D. THE *1	LEGEND:												
USING A 140 POUND WEIGHT FALLING FREE FOR A DISTANCE OF 30".													

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_ '	I	FILE NO. 6378		SAM	PL	E DATA	UNCONF	NED CO	MPRESSI	YE STR	ENGTH	- T. S. F.										
	DEPTH		Ξ	≽	ا ہے ا	¥	1.				o <u>5</u> .											
98.	ā	SOIL DESCRIPTION	DEPTH	VER S	BEI	DRY 3./FT	PL ASTIC	LIMIT %	WATER	CONTENT	% Liqu	ID LIMIT 9										
	STRATA	•		TYPE RECOVERY	3		STAND	RD PF	NETRATIO	ON TERT	_ 'N"	VALUES										
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BURING 12A

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		_FT. W.D.	COMPLETED SAME								DOLTO	<u> Plan</u>	T
		_FTHR. A. D.	DRILLER WANDERSE	<u> </u>	_			OLTON.					
	l	- FT	HELPER BANES		Cı	LIEN	IT MCKE	NOZE:	HENT	CAL COM	PANY		
_	l	FTHR. A. D.	FILE NO. 6378	_	1_		DOLT	ON. IL	-				
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ļ	1		A.D. AFTER DRILLING									•	• •
	THE "N	" VALUES IN THE STAN	PARD PENETRATION TEST AR	E BLO	WS P	ER I	OOT REGI	JIRED TO	DRIVE	A 2" O.D.	SPLIT SP	OON SA	MPLER
J	DSING	A 140 POUND WEIGH	T FALLING PREE FOR A D	HATEL	ICE	OF	30".						

1501	501 E. MAIN STREET, GRIFFITH, IND								3 NO	<u> </u>
WAT	TER LEVEL DATA STARTED 10/7/83		LC	CA	TION_N	k KESSO	N CHEL	I CAL C	OMPANY	
	FT. W.D. COMPLETED SAME		1_		0	BSERVA	TION W	ELLS.		LANT
1	FTHR. A. D. DRILLER WANDERSEE	<u>:</u>	_				LLLIN			·
	FTHR. A.D. HELPER BANES		CL	IEN				L COMP	ANY	
	FTHR. A.D. FILE NO6378					ON, IL				
Ξ	GROUND ELEVATION: 592.68		SAN	APL	E DATA	UNCONF	INED CO	MPRESS	VE STREM	IGTH - 1.8.F
DEPTH		1	≥	0	¥ n			.0 3.		
	SOIL DESCRIPTION	₹			ᇎᄔ	PLASTIC	LIMIT %	WATER	CONTENT %	LIQUID LIMIT
IAT	SOIL DESCRIPTION	DEPTH	TYPE	NUMBER	33./	STANDA	RD PE	ETRATIO	N TEST -	- "N" VALUES
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1.0	CRUSHED SLAG AND CINDERS		 			}	İ			
t l	MEDIUM DENSE BLACK CLAYEY FINE SAN	b,	1/L	17	ĺ		Δ	1 1		
F_ ^	TRACES OF FINE TO COARSE GRAVEL AND	2.5	$V \Gamma$	1						j.
3.0	CINDERS DAMP	 		-		/	i	1 1		1
	SOFT DARK BROWN SANDY CLAY, TRACES OF GRAVEL, WET		11	2			1 .		1	
- ^	or GRAVEL, HEI	<u> </u>	!/ -	┨		17]		1
5.0	SOFT GRAY ORGANIC CLAYEY SILT,	5.0	1	1]	1/	J	j j		ţ
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		7.5-		1	l		1			j
-8-0	LOOSE GRAY SILTY FINE TO COARSE SAN	B	{/}	4		 				
ر د•م	MOJST, TRACES OF ROOTS & FINE GRAVE			1						1
-	STIFF GRAY SILTY CLAY, MOIST	<u> </u>					ļ			
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	WHILE DRILLING, A.D. AFTER DRILLING							_		
THE "	" VALUES IN THE STANDARD PENETRATION TEST AS	E DLC	WS P	ER	FOOT REG	UIRED TO	DRIVE A	2" 0.0. 8	PLIT SPOOF	N SAMPLER

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	TER LEVEL DATA	STARTED10/12/83		LC		TION_	1cKesso	n Cher	nical (Co.			
	.FT. W.D. .FT. <u>1/4</u> HR. A.D.	COMPLETED Same		1-			Observa Dolton,		lells,	Do I tor	Plant		<u> </u>
للبيلا	.F I. <u></u> HR. A. D.	DRILLER <u>Wanderses</u> HELPER <u>Banes</u>		-	IFN	T MCK	esson C	hemica	Com	any			_
		FILE NO6378		_		Doli	ton, IL						_
	GROUND ELEVATIO	N: 391.91		SAI	MPL	E DATA	UNCONFI	NED CO	MPRESS	IVE STR	ENGTH	~ T.S.	F.
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	6011 0		E	TYPE	NUMBER	UNIT DRY WT. LBS./FT.\$	PLASTIC	LIMIT %	WATER	CONTENT	% LIQUI	D LIMIT	%
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-	Crushed slag a	nd rubble (fill)			T								Ť
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-	organic	lack silty fine sand	2.5	/	1			7			ļ.		
3.o		·	2.5		†					ļ	}		
4.0	Light brown and	yellow silty sand	-	+	┨	l		(f)					\vdash
F	Stiff gray clay	some organic		/	2			7	[-			
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5. 0	Soft grav clav.	some organic lenses	1- 1	_	4		 	/]	}	` ` `		-
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,		IELBY TUBE		<u> </u>	UGE	R 💹	- ROCK CO	DRE (-CAL	IBRATED	PENETRO	METER	
Į: J.	WHILE DRILLING,	A.D. AFTER DRILLING											

THE "N" VALUES IN THE STANDARD PENETRATION TEST ARE BLOWS PER FOOT REQUIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER USING A 140 POUND WEIGHT FALLING FREE FOR A DISTANCE OF 30".

	LISBURY EI E. Main str	IND.			1		· B	ORING	NU	10 .	
5.6		L		CI	IEN	т <u>МсК</u>	Dolton, esson C ton, IL	tion l IL hemica	dells, al Comp	Dolton anv	
Ξ	GROUND ELEVATION	in: 592-59	7	SA	MPL	E DATA	UNCONFI	HED CO	MPRESSI	YE STREE	IGTH -
STRATA DEPTH	SOIL D	ESCRIPTION	DEPTH	TYPE	NUMBER	UNIT DRY WT. LBS./FT.\$	STANDAL	EIMIT %	NETRATIO	ONTENT%	LIQUID I
-8	Crushed stone a	nd rubble			+		10		20 30	40	. 50
.0	Medium dense gr			- -	-	•					
ו ח.י	Medium dense bl	ack silty sand own clayey silt, medium sand and	2.5	<u>//</u>	1 2			⊕ •			
• •	Loose gray and silt, trace org		5.0	$\ \cdot \ $			17 1		G		
:5	1	brown coarse sand gray silty clay	- ! (w	7	3			-(
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	ER LEVEL DATA STARTED 10/12/83		LO	CA.	TION_	1cKessoi	n Čt	nemical (Co.		·
	FT. W.D. COMPLETED Same		_	_	()bserva	tior	Wells,	Doltor	Plant	t
	FTHR. A.D. DRILLER Wandersee	<u> </u>	-		McKe	Dolton,	hemi	cal Com	2201	·.::	
	FT. — HR. A. D. HELPER Banes		CL	IEN	T DO	ton, IL	пент	Car Com	SailA."		
T	FTHR. A.D. FILE NO6378		_					COMPRESS			
E	GROUND ELEVATION: 592.49	} }	SAN	APLI	E DATA	·		(
DEPTH		_	₹	2	¥ nj	PLASTIC		% WATER			.0 6.0
	SOIL DESCRIPTION	ЕРТН		NUMBER	ORY W'	+			3		
STRATA		8	ငပ္ပြ	Ž	UNIT (STANDA	RD :	PENETRATI	N TEST	- "N"	VALUES
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-	Asphalt	}	A	1]		1 F
E . 1	Crushed slag and concrete										
2.0	Black sand and cinders	2.5	7							1	
3.0	Drack Saile and Criticals	[]		2		ļ Ļ!		3			
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	Loose brown and gray sandy silt with sand seams from	5.0	/	13	•	🖰		e			
F	4.9' to 5.0' and 9.4' to 9.5'		4	4				\		ļ	
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10.0	A^{*}		<i> </i>	┪.	Ì	1				1	1 t
	Loose gray fine to coarse sand,	10.9	7	٦_	i		!	Ì	1	ł	F
7	little silty clay and fine gravel		/L	6		1 4 1				}	1 t
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	stiff gray silty clay, traces of fine gravel	12.5		7	1		\sum_{i}]	l t
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1 1/1-5	SPLIT SPOON 💹 -SHELBY TUBE III - PISTON		1 - /	AUGE		- BOCK C	ORE	Ф-с4	IRRATED	PENETR	DMETER

W.D. WHILE DRILLING, A.D. AFTER DRILLING

THE "N" VALUES IN THE STANDARD PENETRATION TEST ARE BLOWS PER FOOT REQUIRED TO DRIVE A 2" O.D. SPLIT SPOON SAMPLER USING A 140 POUND WEIGHT FALLING FREE FOR A DISTANCE OF 30".

BOOM 176-17

APPENDIX II-B-4
1988 INVESTIGATION

	Ā	TEC Associates, Inc.	5 -9 0	;	L	.06 0	F SOIL	BOF	RING N	o. <u>SK</u>	- <u>1</u>	of 1
		WATER LEVEL DATA STARTED 10/5/88		-	LC	CATION	Safet	•			····	
		_FT. W.D. COMPLETED 10/5/88		-	_				ility			
	—	FTHR. A.D. DRILLERSheffield		-	_				llinois en Cor			
	—	FT HR.A.D. HELPER Morgan ST. HR.A.D. FILE NO. 8-3217	_	-	CL	IENT	-	•	linois	poralic	211	
			_	-1	=							
		GROUND ELEVATION:	S	MA	PLE	DATA			MPRESSIV			7. 5.1
,	DEPTH	SOIL DESCRIPTION AND STRATA DEPTH	TYPE	RECOVERY	NUMBER	HnU Readings	PLASTIC L PLASTIC L 10 STANDAR	2	WATER CO	40	בופטום 50	
;							10	- 2	o\$50	46		
		Black SILT FILL, with sand and		Ц						ł	İ	
		Black silty TOPSOIL, with organics]/	┝┥	1	120.0	4	4				
j	-2.5		\mathcal{L}						! !	Ì		
		Stiff, yellowish-brown and gray, mottled, CLAY, massive, trace					1 11					
		fine gravel and root channels	\prod	\Box	2	19.0	l 从		(H)	İ		
	-50-	•	L	H					4	- 1		
	33									1		
•		Black oily layer noted in	7	П		15.0			9	-		
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	1.	1. Field Geologist - Andy Reeves				 :T - \$ POCN	A	AUGER		SHE	LBY TUBE	
						TON		ROCK		A SAL	IBRATED	
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						THE "N"VALUES IN THE STANDARD PENETRATION TEST ARE BLOWS PER FOC REQUIRED TO DRIVE A 2" C.D. SPLIT-SPOON SAMPLER USING A 140 LB WEIS-						
							DR A DISTAN			CER USII	140L	Pr 4219,

Y	TEC Associa	1165, 1116. riffim, is 4311-21-22-66 um, Lomers, it 6014-32-12	0 · 3:2-375-90	, l	LOG O	F SOIL	BORI	NG NO	o. <u>SK</u>	-2 et 1	_
	FATER LEVEL DATA		5/88	_	OCATION	Safet	v-Klee	n Corp			<u>01</u>
	FT. W.D.	COMPLETED_10/		- -			n Faci				
	FTHR. A.D.	Dell'se Shef	field			Dolto	n. 111	inois			1
	FTHR. A.D.		an .	_	LIENT _	Safet	y-Klee	n Corp	oratio	ח	
	FTHR. A.D.	1	17			Elgin	<u>, 111 i</u>	nois			
	GROUND ELEVATION		Is	MPL	E DATA	UNCONFIN	ED COMP	RESSIVE	STREN	6TH -	_
	BROOMD ELEVATIO	<u></u>				1.0	2.0	$ \bigcirc$	4.0	8 .0	
=				NECOVERY NUMBER	HnU Readings	PLASTIC		ATER CO	HIENI %	FIGNID	. 브
DEPTII	SOIL DESCRIPTION	ION AND STRATA D	EPTH E	ECOVE R NUMBE	1 E 8	10 STANDAR	D PENE	30 TRATIO	40 TEST	90 - • N• 1	
5				F 2	Ē	10	20	क्रे	40	50	
	Medium stiff, bl	ack silty TOPSO	L,		1		-	1		T	_
	l with organ	nics trace grant	iles,	님				i	ļ		
	Strong St	olvent odor	/	1	140.0	4				1	
-2.5-	2.51 Loose yello	h root channels	r	Н	ļ	\ \		!			
	j	····	ַ ע			\ \				1	
-	Stiff yellow	ish-brown and	. 1/	2	100.0	À	\oplus	1			
-5.0-	gray, mott	led, CLAY, mass	ve,		İ		7				
	some green	and red mottle	:5	•				-		- [Į
			17				<u> 6</u>	İ	j	1	
	7.0'	.	V	3	14.0	1. 4	Y	j		1	
-7.5	Very stiff,	dark gray silty	-			 	\				į
		inated with tra	ces 📙	Н		/					
	of fine gr	ravel .	1/	4	3.0	Δ		₩			
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	boring ended	at 10.0	-		Ţ				- 1	l	1
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1.	Field Geologist	- Andy Reeves	1 1	Z SP	LIT - SPOON		AUGER		SHEL	.BY TUB!	£
					STON	777	RCCK CO	RE	A CALI	BRATED	_4
				11						TROMETE	

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A	EC Associates, Inc.	5-90	32	L	.OG 0	F S01	L BO	RING	NO.		K-3	- 5 1
H	ATER LEVEL DATA STARTED 10/6/88		-	L	CATION	Safe	etv-Kl	een C	orpor		et 1	<u> </u>
	_FT. W.D. COMPLETED 10/6/88		_	-			ton Fa					
-	_FTHR. A.D. DRILLERGreen		_	_			on I					
_	FTHR.A.D HELPER Pavelka		-	CI	LIENT _		ty-Kl			atio	<u>n</u>	
	_FTHR.A.D. FILE NO8-3217		-	_			in, 11				335.5	
	GROUND ELEVATION:	S	AM	PLE	DATA	UNCONFI	HED C	OMPRES	SIVE	STREN	6TH -	7.5.1
1_			¥	E	HnU Readings	PLASTIC		LO WATE	3.0 R CONTE	4 D	בונטום בונטום	
PTH	SOIL DESCRIPTION AND STRATA DEPTH	YPE	RECOVERY	NONBE	표를			20	\$	40	50	
DE		-	MEC	Ę		STANDA			TION			
	Dark gray gravel, sand and silt	╁		<u> </u>	<u> </u>	9		<u> </u>	<u> 725</u>	4¢	<u>50</u>	
\vdash		+,					;				1	
	2.0' Loose, gray to black, silt and clay FILL	∜/	H	1	350.0	4			i		1	
-2.5-		۲	1			\			İ	1		
	Very stiff to stiff, yellow-	Ь			160.0					i		
	brown CLAY, mottled, with traces of Fe/Mn nodules.	1/	\vdash	2	180.0		 	\Rightarrow	'	1.		
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	becomes gray with depth	Н					1/					
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-7.5		1			į .			1		1.		
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NOT	ES:	LEGEND										
''	Field Geologist - Andy Reeves	SPLIT-SPOCN A AUGER SHELBY TUBE										
	•	-		TON	<u> </u>	ROCK		₩.	PENE	RATED TROMETE	R	
1	•	W.D. WHILE DRILLING A.D. AFTER DRILLING THE "N" VALUES IN THE STANDARD PENETRATION TEST ARE BLOWS PER FOCT REQUIRED TO DRIVE A 2" C.D. SPLIT-SPOON SAMPLER USING A 140 LB. WEIS-										
1		1	REC	ZUIR	ED TO DR	IVE A Z C	.D. SPLIT	T - 3 P O O N	SAMPLE	R USIN	4 140 L	B. WEIS-

ĀŢ	EC Associates, Inc. District Auto Street, Sertifica, 18 4379-279-321-4490 - 372-375 District Auto Street, Lamana, 12 40141-372-372-377	5-30	=	L	.og o	F SOII	L BC	RING	NO	SK-4	of 1
	ATER LEVEL DATA STARTED 10/4/88 FT. W.D. COMPLETED 10/4/88		-	LC	CATION			leen Co	rporat	~	
	FTHR.A.D. DRILLERSheffield		_	_		Dolt	on.	<u>Illinoi</u>	5		
	FTHR.A.D. HELPERMorgan		_	CI	IENT			<u>leen Co</u>		<u>ion</u>	
	FTHR A.D. FILE NO8-3217		_	_		Elgi	<u>n, l</u>	llinois	-		
	GROUND ELEVATION:	S	M	PLE	DATA	UNCONFI	NED C	OMPRESS	IVE STR	ENSTH	- T.S.F.
DEPTH	SOIL DESCRIPTION AND STRATA DEPTH	TYPE	HECOVERY	NUMBER	HnU Readings	CHATE	LIMIT	20 ENETRAT	CONTENT	بره الرها 140 ع	O 6. D LIMIT % O 6. VALUES
	Stiff, yellow-brown SILT and CLAY, FILL,with some gravel	7		1	2.0	10	. 4	20	56	46 5	SO 84
	Stiff yellowish-brown CLAY, with traces of gray mottles, some silt	7	-	2	4.0	4	/)			
	6.0' Stiff gray silty CLAY, some	/		3	No Reading						
-7.5	Mn/Fe nodules and yellow- brown mottles, fractured, with stains along fractures 10.01	7		4.	4.0						
300	Boring ended at 10.0'									·	
-2.5-							•				
-15.C-											
17.5											
-500					:						
-22.5											
25.0 NOTE	S:	 	FG	EN	ID	<u>! · </u>		- ! · ·		2 .250	1
	ield Geologist - Andy Reeves	֓֞֞֜֜֜֞֜֜֜֜֜֜֓֓֓֓֜֜֜֜֟֜֜֓֓֓֓֓֓֓֓֡֜֜֜֜֓֓֡֓֜֜֡֓֡֓֜֜֡֓֡֓֡֡֓֜֡֡֡֡֓֜֡֡֡֓֜֡֡֡֡֓֜֡֡֡֡֡֓֜֡֡֡֡֓֜֡֡֡֡֓֜֡֡֡֓֜֜֡֡֡֓֜֜֡֡֡֡֡		SPL PIS'	IT - SPOON TO N HILE DRIL	LING AL	D AFT	CORE	⊕ \$	ELBY TUE	FE A
:		j 6	REC	UIR	ED TO DRI	N THE STAI IVE A 2° O. OR A DISTA	D. SPLI	T-SPOON S	ON TEST A AMPLER U	RE BLCWS SING A 140	PER FOCT LB. WEIGHT

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Ā	TEC Associates, Inc.	?5 -3	c32	L	.0G 0	F SOIL	BOR	ING NO	SK	-5	
	VATER LEVEL DATA STARTED 10/4/88			LC	CATION	i <u>Safet</u> y				t 1 of 1	
	FT. W.D. COMPLETED 10/4/88		_	_		Doltor		-			
1—	FTHR.A.D. DRILLERSheffield		_					<u>linois</u>			
	FTHR.A.D HELPERMOTGAN		- ;	Cr	JENT _			n Corp	oratio		
	_FTHR A.D. FILE NO8-3217	_		<u>L</u> =		Elgin					
	GROUND ELEVATION:	S	AM	PLE	DATA	UNCONFINE	D COM	PRESSIVE	STREN	TH - T.S.1	
1_	·		F	E	. 8	PLASTIC LI	2.0 MT %	WATER CON	TENT %	FIGUID LINIT &	
EPTN	SOIL DESCRIPTION AND STRATA DEPTH	1		NUMBE	투		20			50	
	•	-	HECOVERY	3	HnU Readings	STARDARD	PEN		TEST -	-M. AVINES	
ļ	V 11	╀	무	<u> </u>	<u> </u>	10	20	329	4C	50	
	Yellow and brown gravelly CLAY,	L]			-				
	Yellow-brown silty CLAY	1/		1	0.0		7				
-2.5-	2.3'	┰	上	1		1 1	'	i			
-	Stiff yellow-brown and gray,	1				1					
	mottled, clayey SILT	17		2	0.0		İ	i	İ		
-5.0-	·	V	L	-		1 7	İ	j			
	6.0'	Г				\	į				
		17	/	1	0.0			Ì	ļ		
-7.5-	Stiff greenish-gray CLAY, with gray and red mottles,	V	L	3	0.0	1 14	¥		}		
[1.3]	and organic layers, (less		1			/		İ			
	than 1" thick)	\vdash	/ –	1.	0.0	1 /	+		į		
	10.0'	V	\vdash	4	0.0	4	⊕	1	1	1	
300	10.0	T	1					1	- 1		
-	Boring ended at 10.0'	-					i		1		
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1"	1. Field Geologist - Andy Reeves			SP <u>L</u>	T-SPOCN		LUGER		SHELD	Y TUBE	
	Table Tabl			P151		-	OCK CO		T PENET	RATED ROMETER	
1		W.D WHILE DRILLING A.D AFTER DRILLING THE "N" VALUES IN THE STANDARD PENETRATION TEST ARE BLOWS PER FOCT									
i			RE	שועכ	ED TO DRI	IVE A 2" O.D.	SPLIT-S	POON SAMP	LER USING	BLOWS PER FOCT A 140 LB. WEISH	

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Ā	DEC Associates, Inc. Digit L. Nein Street, Sriffith, IN 4319 - 279-921-4698 - 312-37	5-901	12	L	OG O	F SOIL	BORING I		(-61) let 1 o	F 2
	VATER LEVEL DATA STARTED 9/30/88		- -	LC	CATION		y-Kleen Co	rporatio		
 —	FT. W.D		-	_			<u>Facility</u>			
	FT. HR.A.D. DRILLER Sheffield		-	_			n. Illinoi v-Kleen Co			-
	1,20,21		-	CL	LIENT		, Illinois	r poracii	<u> </u>	
<u> </u>	11.6 240.	le.		_	DATA	UNCONFINE		VE STREM	ETU -	T. S.F.
	GROUND ELEVATION:	1	M	PLE		1.0	2.0 3	.0 40	5.0	
DEPTH	SOIL DESCRIPTION AND STRATA DEPTH	TYPE	COVERY	NUMBER	HnU	PLASTIC LI 10 STANDARD	MIT% WATER	ONTEHT %	בופטוס נו	60
۵					Œ	. 10	20	6 40	50	60
	Dark brown, gravel, sand and	П					•			-
	1.4' silt, FILL	17	\dashv					i l		ţ
-	1.8' Dark greenish-gray silty CLAY, FILL, laminated, little sand and gravel, metalic	V	4	1	1.0		\mathcal{S}	! !		-
-2.5-	sand and gravel, metalic / shavings	Н								Ī
<u> </u>	Shavings	H	┥							-
		I	j	2	1.0	A				F
-5.0-	Medium stiff and stiff, gray	Н								-
	and yellow-brown CLAY,	Ц	_				İ			ļ
	little silt,trace sand	И	ł		0.0		1		i	f
-7.5	laminated root channels,	Н	\dashv	3		YT	4]		Ę
-	fractured, with moisture concentrated along the	Ц				X		1 1	1	t
3.0.5	fractures, Fe/Mn nodules;	И	Ì	,	0.0	Lάλ	. 1		- 1	-
300	gray color increasing	U	_	4		TV	Ì			
	with depth				'	I N	, i	1	1 1	
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-15.0 -		Н					· 11			ļ
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-17.5	17.5'	$\ \ $					 			[
	Very stiff gray silty	Ц					!			į
	<pre>CLAY, trace granules laminated root channels,</pre>	M		,	0.0		/ ф		ļ ,	ļ
500	fractured, with moisture			1	0.0	-	$\mathcal{X}\mathcal{X}$			‡
	concentrated along the									i
	fractures, Fe/Mn nodules								į.	
22.5		П	٠							į
	23.01		ļ							Ī
	(continued)	H	┥						\sim	
25.0	·	VI.	4	8	0.0	(conti	nued)	1 4	⊕ [
NOT		L	ΕG	ΕN	D					
١.	Field Geologist - Andy Reeves		<u> </u>	SPLI	T - S POON	A	LUGER	SHEL	BY TUBE	
		ΙĪ	<u>י</u>	157	ON	<u> </u>	ROCK CORE	A SALI	BRATED TROMETER	
					HILE DRIL		AFTER DRILLING	· · · · · · · · · · · · · · · · · · ·		
		T	HE	"N [®]	VALUES II	THE STANDA	ARD PENETRATIC SPLIT-SPOON SA	N TEST ARE	BLOWS PER	FOCT
						R A DISTANC		45% 95%	· - • - •	~ P14111

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A	EC Associates, Inc.	i75- 3 9	352	Ĺ	.0G C	F SOIL	BOF	RING	NO	SK-6D	·F 3
DEРТН	FILE: 8-3217 SOIL DESCRIPTION AND STRATA DEPTH (CONTINUED FROM 22.5')		AMI	NUMBER	CBS./FT. ST.	1.0 PLASTIC L 10 TANDAR	IMIT %	METRA	3.0 CONTENT	4.0 6 % LIQUII 40 5 ST - "N"	0 D LII
	23.0'	۱,	\sqcup		0.0						
25.0-		1		8	0.0						
275-	Very stiff to hard, silty CLAY to clayey SILT, laminated with traces of Fe/Mn nodules			9	0.0						
-305-				כ							
-32.5		7			0.0						
35.G-		/_		10						 	
3 7.5-	37.0' Dark gray SILT and CLAY, with little fine gravel, massive										
40.0				11	0.0						
42.5	43.5' BEDROCK; gray dolomite	_									
45.0	45.3'										
47.5-	Boring ended at 45.3'										
500											
-525								ļ			

TIM Flamman Inc. le	111150 14 40 13 45 13-35 4 44 10 7.	3-2-2-						NOS	***	
	fffizh, 18 46319 • 219-924-6690 • 312-37 th, Lemove, 12 66148 • 312-932-6670		├-						neet 1	<u>of</u>
WATER LEVEL DATA	STARTED 9/29/88		LC	CATION		on Fac		rporati	<u>on</u>	
FT. W.D.	COMPLETED 9/29/88		-			on Fat			·	7
FTHR. A.D.	14		-	.=N.=				rporati	ion	
FTHR. A.D.	HELPER -		CI	LENT _		in, 11				
FIHR A.D.	FILE NO		上							
GROUND ELEVATIO	N:		1	DATA	1 ——	NED CO	(\sim	ENGTH -	<u>- т.</u>
_		=	NUMBER	HnU Readings	PLASTIC			CONTENT S		
SOIL DESCRIPTI	ON AND STRATA DEPTH	TYPE	2	로	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -			2		- - -
i i			Z	- 2	STANDA	RD PE		ON TEST	- °×°	VAL
		<u> </u>	1		91	2	<u> </u>	3 55 4	C 90	0
	y clay TOPSOIL, trace	1	İ			-			ļ. ļ	
1.2' sand and	brown,silty fine	17	٦.							
SAND wit	h gray mottles and	1/1	1	0.0	1 4			:	1	İ
3.0' rare red	h gray mottles and mottles	H	1	ļ 1	1 1			İ		
		Ţ .¦-	4		1				!	
		1/	2	0.0	l 人			\oplus	1	ĺ
	gray CLAY, with	μ	-		I			1		ŀ
yellow-br	own mottles,				1 \					
	, some Mn/Fe	1	1)			А		Į
	thin sandy lenses	V	3	0.0	4	7				
7.5 at top, a	pprox. 1 cm thick,	П	1		1 /					
and root	cnanne is		4		1 /					
		I /I -	4	0.0		-	7			1
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Boring ended	at 10.0°				i 1]	ł
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NOTES:		LE	GEN	(Đ		<u>.</u>				
1. Field Geologist	- Andy Reeves		SPL	:T - S POON	ı Ā	AUGER		SH	ELBY TUB	بير £ ا
		! ==	PIS			ROCK	TORE		LIBRATED	- 46
		J —		HILE DRIE	LLING A	d. = after	_		METROMETI	ER
		TH	E "N	VALUES I	N THE STA	NDARD PE	NETRATI	ON TEST AS	RE BLOWS	PER

A	DIST E. Noin Street, Sriffith, 18 4319 - 219-524-6651 - 312-37	7.	L	og o	F SOIL BORING NO. SK-7D Sheet 1 of 2										
	FATER LEVEL DATA STARTED 9/29/88			LO	CATION	Safety-Kleen Corporation									
17.	OFT. W.D. COMPLETED 9/30/88		_		<u> </u>	Dolton Facility									
 	FTHR. A.D. DRILLERSheffield		-			Dolton, Illinois									
 	FT HR.A.D. HELPER Morgan FT HR.A.D. FILE NO. 8-3217		-	CL	IENT	Safety-Kleen Corporation Elgin, Illinois									
		1-	<u> </u>	_	2454	UNCONFINED COMPRESSIVE STRENGTH - T.S.									
	GROUND ELEVATION:	18			DATA	1.0 2.0 3.0 40 5.0									
l _≖ l		س	MECOVERY	NUMBER	> E	PLASTIC LIMIT % WATER CONTENT % LIQUID LIMIT									
рертн	SOIL DESCRIPTION AND STRATA DEPTH				HnU Readings	10 20 30 40 50 STANDARD PENETRATION TEST - "N" VALUE									
ă			E		Ě	10 20 30 46 50									
	Black silty TOPSOIL, little	T				-									
	1.2'gravel trace root channels	17	H												
	Loose, yellow-brown silty fine SAND, 2.6 gray mottles, little clay, root	V		1	0.0	4									
2.5	channels	Γ	П												
\vdash		1			0.0										
	·	V		2		4 9									
-5.0-		╀													
	Stiff to very stiff, gray CLAY	1	 		0.0										
	with yellow-brown mottles, laminated, root channels and	V		3	0.0	 									
-7.5	Fe/Mn nodules noted in	Γ	П												
-	Sample #3	1	Н												
		/ /		4	0.0	4 9									
100	a ·		П												
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''	Field Geologist - Andy Reeves	1:	=		T - SPOON										
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ł		1	REC	אועם	ED TO DRI	IVE A 2" O.D. SPLIT-SPOON SAMPLER USING A 140 LB. WEIG OR A DISTANCE OF 30".									

Z	TEC Associates, Inc. 1501 E. Asia Street, Selffith, 18 Majig-219-924-6490 - 312-37 150 Eleanhouse Loss South, Lamberd, 1L 601M - 312-932-0970			<u> </u>		F SOIL		She	SK-/U	
ОЕРТН	FILE: 8-3217 SOIL DESCRIPTION AND STRATA DEPTH (CONTINUED FROM 22.5')	TYPE	ž	Т	CBS./77. SBJ	1.0 PLASTIC LIM	Z.O	SO TION TES	% Liquit 40 50 T - "N"	- -
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25.0	Hard, laminated silty CLAY, with alternating greenish-gray and black layers, trace fine sand and Mn/Fe nodules	Z	_	8	0.0				₽	
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-300 -32.5										
35.0	33.7'	7		10	0.0				₽	
	Hard dark gray SILT, massive, with some clay and traces of Fe/Mn nodules									(
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Ā	TEC Associates, Inc.			,	000	E COU		DING		Ch.	, U			
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	VATER LEVEL DATA STARTED 9/29/88		T	LC	CATION	ı <u>Safe</u>	ty-K	leen.	Corpo					
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	_FTHR.A.D HELPERMorgan		- [CL	LIENT			leen Ilino		ratio	<u>n</u>	<u> </u>		
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-7.5	rea mottres noted below 7.0	Н	\dashv	1		1 /	I	1	1					
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	Field Geologist - Andy Reeves All Samples were brittle and dry.		_		IT - SPOON	<u>.</u>	AUGE	R ·	1	SHELL	84 TUSE			
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Ā	TEC Associates, Inc.			1	OG O	F SOIL BORING NO. SK-10								
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V	STARTED 9/29/88		_	LC	CATION	NSafety-Kleen Corporation								
	FT. W.D. COMPLETED 9/29/88		-	-		Dolton Facility Dolton Illinois								
	FTHR.A.D. DRILLER <u>Sheffield</u> FTHR.A.D. HELPER <u>Morgan</u>		- ;	C L	CLIENT Safety-Kleen Corporation									
<u>-</u>	_FTHR A.D. FILE NO8-3217		_	_		Elgin, Illinois								
	GROUND ELEVATION:	s	AM	PLE	DATA	UNCONFINED COMPRESSIVE STRENGTH - T.S								
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-	yellowish-brown silty CLAY,	/		2	0.0									
-5.0-	mottled, trace sand and	Ł	-											
	gravel ·	L	<u> </u>											
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	•		_	PIS'		A LI AUGER SHELBY TUBE ROCK CORE GALIBRATED PENETROMETER								
			W. C). = W	HILE DRI	LLING A.D. AFTER DRILLING								
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Ā	IEC Associates, Inc.	5-98		L	_ .0G 0	F SOIL	BOR	ING NO	. <u>SK</u>	-11					
	1531 E. Rein Street, Briffins, IN 46319 - 2:5-928-6692 - 312-37 130 Elsenhauer Lans South, Lamoure, IL 40148 - 312-932-0070		4							et 1 of 1					
'	FT. W.D. COMPLETED 9/28/88		-	LC	CATION			en Corp :ility	oratio						
-	FT. W.D. COMPLETED 9/28/88. FT. HR. A.D. DRILLER Sheffield		-	_				linois							
	FT HR. A.D. HELPER Morgan		_	CI	LENT	Safety-Kleen Corporation									
	_FTHR A:D. FILE NO8-3217		-			Elgi	n, 111	inois		<u> </u>					
	GROUND ELEVATION:	Ŝź	M	PL	DATA			MPRESSIVE	STREN	6TH - T.S.7					
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	clay TOPSOIL, little gravel, 2.0' trace sand, yello-brown mottles	Н						!							
	2.0' trace sand, yello-brown mottles	1/1		1		1 7	•		Ì	-					
-2.5-	Medium dense light brown fine to 3.0' medium quartz SAND.sub-rounded	П				1 1									
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1.	<u> ES:</u> Field Geologist - Andy Reeves		_	SP!	.1T - S POON	ភា	AUGER	•	E Sugar	BY TUBE					
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APPENDIX II-C

GRAIN-SIZE DATA
DOLTON RECYCLE CENTER

II-C-1 1983 INVESTIGATION

II-C-2 1988 INVESTIGATION

LABORATORY TESTING PROCEDURES

Soil Classification

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply his past experience to current problems. In our investigations, samples obtained during drilling operations were examined in our laboratory and visually classified by an engineer or geologist. The soils were classified according to consistency (based on number of blows from standard penetration tests), color, and texture. These classification descriptions are included on our "Test Boring Records".

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary, grain size tests and plasticity tests. Using these test results, the soil can be classified according to the AASHO or Unified Classification Systems (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provides and index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

Grain Size Tests

Grain Size Tests are performed to determine the soil classification and the grain size distribution. The soil samples are prepared for testing according to ASTM D-421 (dry preparation) or ASTM D-2217 (wet preparation). The grain size distribution of soils coarser than a number 200 sieve (0.074 mm opening) is determined by passing the samples through a standard set of nested sieves. materials passing the number 200 sieve are suspended in water and the grain size distribution calculated in accordance with ASTM D-422.

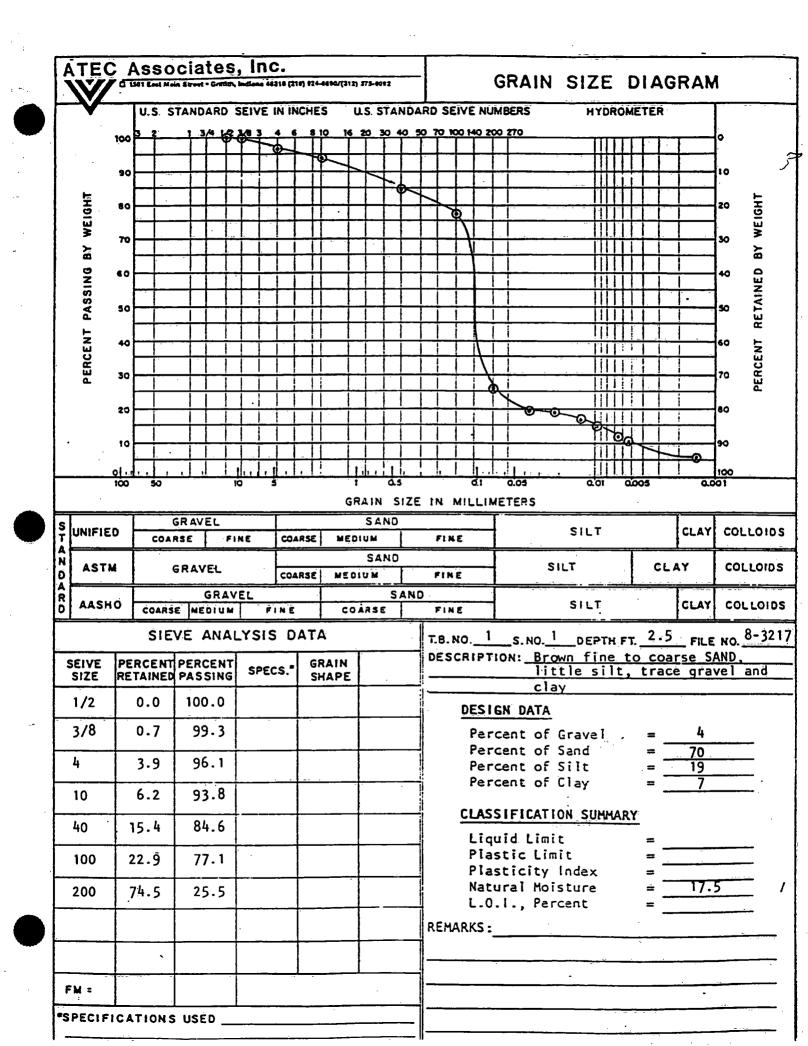
APPENDIX II-C-1
1983 INVESTIGATION

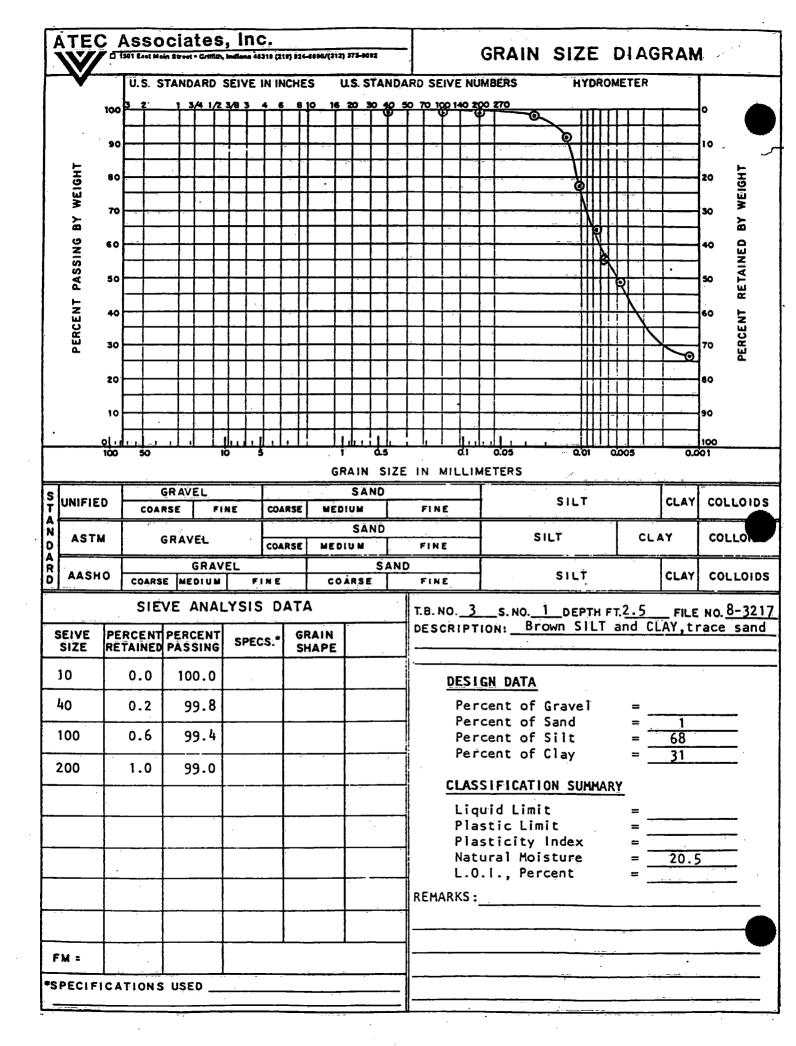
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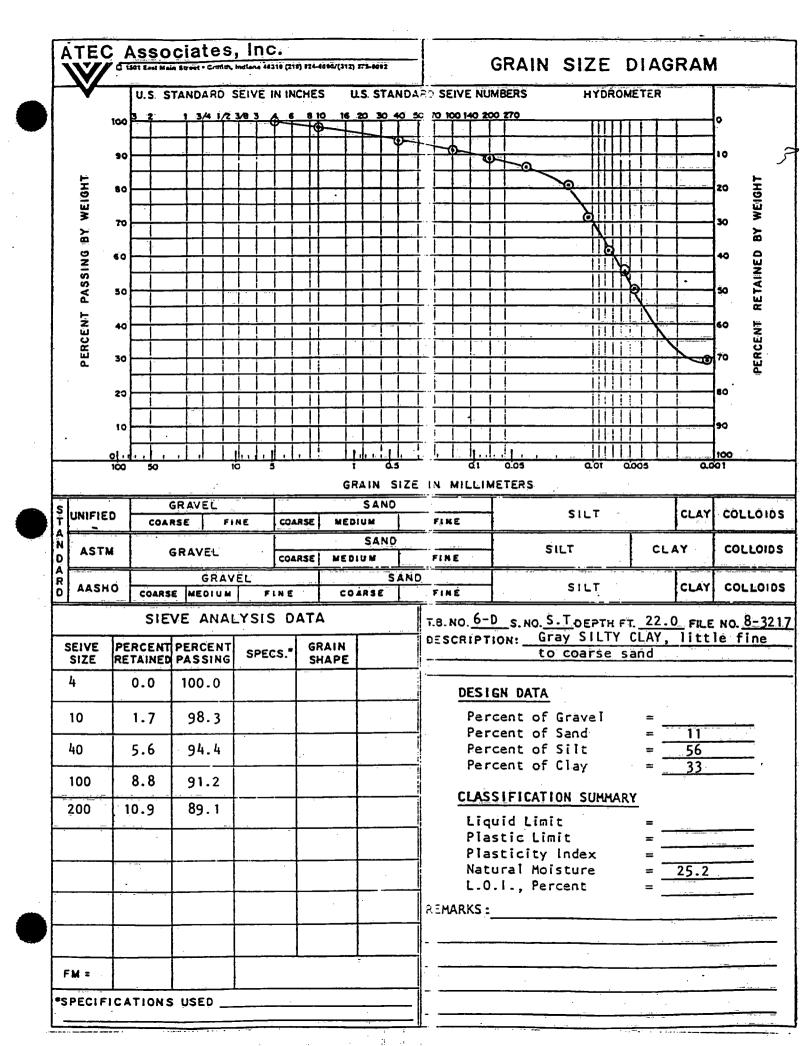
ALISBURY ENGINEERING GRAIN SIZE DIAGRAM 501 E. MAIN STREET, GRIFFITH, IND. HYDROMETER U.S. STANDARD SEIVE IN INCHES U.S. STANDARD SEIVE NUMBERS 100 10 90 PERCENT PASSING BY WEIGHT 20 WEIGH 80 70 Ä RETAINED 60 40 50 50 PERCENT 30 70 60 20 10 90 100 0,01 GRAIN SIZE IN MILLIMETERS GRAVEL SAND COLLOIDS UNIFIED SILT CLAY COARSE MEDIUM FINE COARSE FINE SAND STM SILT CLAY COLLOIDS GRAVEL. COARSE MEDIUM FINE GRAVEL SAND' AASHO SILT CLAY COLLOIDS COARSE MEDIUM FINE COARSE FINE T.B. NO. 14 S. NO. 4-4 DEPTH FT. 8 5' FILE NO. 6378 SIEVE ANALYSIS DATA DESCRIPTION: Gray fine to coarse silty sand SEIVE. PERCENTIPERCENT GRAIN SPECS.* trace fine gravel RETAINED PASSING SIZE SHAPE DESIGN DATA EFFECTIVE DIAMETER, Dio COEFF OF UNIFORMITY, Cu = Deo/Dio = ___ PERCENT MINUS 0.02 mm PERCENT OF BOULDERS PERCENT OF GRAVEL _ 1.0_ 79.0 PERCENT OF SAND 20.0 PERCENT OF SILT PERCENT OF CLAY METHOD ASTM D 422-72 ____ OTHER GRAIN SHAPE KEY A-WELL ROUNDED D-SUBANGULAR G-FLAKE B - ROUNDED E-ANGULAR H-PORQUS C-SUBROUNDED F - ELONGATED FM = SPECIFICATIONS USED _ REMARKS

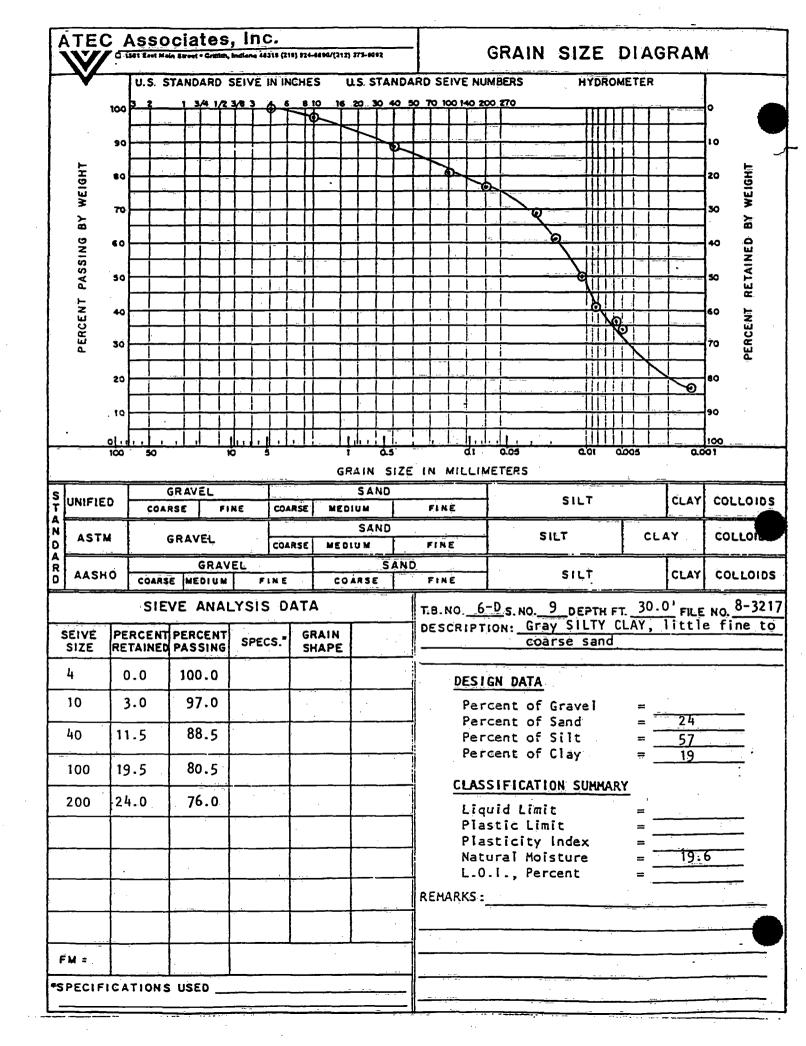
SALISBURY ENGINEERING GRAIN SIZE DIAGRAM 1501 E. MAIN STREET, GRIFFITH, IND. U.S. STANDARD SEIVE IN INCHES U.S. STANDARD SEIVE NUMBERS HYDROMETER 10 90 BY WEIGHT BY WEIGHT 80 20 70 PERCENT PASSING RETAINED 60 50 PERCENT 30 80 20 10 GRAIN SIZE IN MILLIMETERS GRAVEL SAND UNIFIED SILT CLAY COLLOIDS COARSE FINE COARSE MEDIUM FINE SAND CLAY SILT COLLOID **ASTM** GRAVEL COARSE MEDIUM GRAVEL SILT COLLOIDS **AASHO** CLAY COARSE MEDIUM FINE FINE COARSE T.B. NO. 17 S. NO. 6 DEPTH FT. 12 01 FILE NO. 6378 SIEVE ANALYSIS DATA DESCRIPTION: Grav fine to coarse sand little SEIVE PERCENT PERCENT GRAIN SPECS. silty clay and fine gravel. RETAINED PASSING SHAPE DESIGN DATA EFFECTIVE DIAMETER, Dio COEFF OF UNIFORMITY, Cu = D60/D10 = ___ PERCENT MINUS 0.02 mm PERCENT OF BOULDERS PERCENT OF GRAVEL 77 0 PERCENT OF SAND PERCENT OF SILT PERCENT OF CLAY METHOD ASTM D 422-72 OTHER GRAIN SHAPE KEY A-WELL ROUNDED D-SUBANGULAR G-FLAKE B - ROUNDED E- ANGULAR H-POROUS C-SUBROUNDED F-ELONGATED FM = SPECIFICATIONS USED **REMARKS** $D_{10} = 0.07$

APPENDIX II-C-2
1988 INVESTIGATION









APPENDIX II-D

LABORATORY DATA REPORTS SOIL QUALITY DOLTON RECYCLE CENTER

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	and the	-				~		_					_	~	

- II-D-2 JANUARY 1990 INVESTIGATION
- II-D-3 AUGUST 1990 INVESTIGATION UNDERGROUND STORAGE TANKS

APPENDIX II-D-1
1988 INVESTIGATION



November 3, 1988

Solid & Hazardous Waste Site Assessments
Remedial Design & Construction
Underground Tank Management
Asbestos Surveys & Analysis
Hydrogeologic Investigations & Monitoring
Analytical Testing / Chemistry
Industrial Hygiene / Hazard Communication
Environmental Audits & Permitting
Exploratory Drilling & Monitoring Wells

Mr. John McBride ATEC Environmental Services 1501 E. Main Street Griffith, IN 46319-0270

Re: Eight Soil VOA
Five Soil RCRA Metals
SW 846 Method 8240, 7000 Series
Safety Kleen

ATEC Project Number 52-83217

Dear Mr. McBride:

Enclosed are the results of the Chemical Analyses for the eight soil samples which were submitted to the ATEC Environmental/Analytical Testing Division on October 6, 1988, on behalf of Safety Kleen. The volatile samples were analyzed on a Finnigan 1020 OWA GC/MS/DS system, complete with Superincos Software, via SW 846 Method 8240 for Purgeable Organic Compounds. Prior to analysis the system was tuned against Bromofluorobenzene and calibrated with the appropriate standard. Metals were analyzed on a Varian Spectr-AA-10 Atomic Absorption Spectrophotometer according to the 7000 series of the methods outlined in SW 846.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

Samples will be held for a period of thirty days following the date of this report, after which re-analysis will require the submission of fresh samples. It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted,

ATEC Associates, Inc.

Feith 5 Heine

Keith S. Kline

Environmental/Analytical

Testing Division

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street

Griffith, IN 46319-0270

Client Sample Identification: B-

B-12 (2.5)/SK-1

Sample Matrix: Soil

Date Sample Collected:
Date Sample Received:
Date Sample Analyzed:

October 5, 1988 October 6, 1988 October 24, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83172E

Analyte	CAS Number	oncentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<500	500
Bromomethane	74-83-9	<500	. 500
Vinyl Chloride	75-01-4	<500	500
Chloroethane	75-00-3	<500	500
Methylene Chloride	75-09-2	<250	250
Acetone	67-64-1	7,400	500
Carbon Disulfide	75-15-0	<250	250
1,1-Dichloroethene	75-35-4	<250	250
1,1 Dichloroethane	75-35-3	<250	250
Trans-1,2-Dichloroethene	156-60-5	<250*	250
Chloroform	67-66-3	<250	250
1,2-Dichloroethane	107-06-2	<250*	250
2-Butanone	78-93-3	6,000	500
1,1,1-Trichloroethane	71-55-6	<250	250
Carbon Tetrachloride	56-23-5	<250	250
Vinyl Acetate	108-05-4	<500	500
Bromodichloromethane	75-27-4	<250	250
1,2-Dichloropropane	78-87-5	<250	250

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83172E

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<250	250
Trichloroethene	79-01-6	<250*	250
Dibromochloromethane	124-48-1	<250	250
1,1,2-Trichloroethane	79- 00-5	440	250
Benzene	71-43-2	<250	250
cis-1,3-Dichloropropene	10061-01-5	<250	250
2-Chloroethylvinylether	110-75-8	<500	500
Bromoform	75-25-2	<250	250
4-Methyl-2-Pentanone	591-78-6	4,200	500
2-Hexanone	108-10-1	<500	500
Tetrachloroethene	127-18-4	46,000	250
1,1,2,2-Tetrachloroethane	79-34-5	<250	250
Toluene	108-88-3	65,000	250
Chlorobenzene	108-90-7	<250	250
Ethylbenzene	100-41-4	10,000	250
Styrene	100-42-5	<250	250
Total Xylenes		95,000	250

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill Verified: K. Kline

Date Reported: November 2, 1988

Respectfully submitted,

Klith 5 Kline
Environmental/Analytical Testing Division

ATEC Environmental Services

Client Address:

1501 E. Main Street

Griffith, IN 46319-0270

Client Sample Identification:

B-11 (2.5)/SK-Z

Sample Matrix:

Soil

Date Sample Collected: Date Sample Received:

October 5, 1988

Date Sample Analyzed:

October 6, 1988 October 21, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83172D

Analyte	CAS Number	oncentration (ug/kg)	Quantitation Limit (ug/kg)
Chloromethane	74-87-3	<330	330
Bromomethane	74-83-9	<330	330
Vinyl Chloride	75-01-4	<330	33 0
Chloroethane	75-00-3	<330	330
Methylene Chloride	75-09-2	<170	170
Acetone	67-64-1	2,200	330
Carbon Disulfide	75-15-0	<170	170
1,1-Dichloroethene	75-35-4	<170	170
1,1 Dichloroethane	75-35-3	<170	170
Trans-1,2-Dichloroethene	156-60-5	<170*	170
Chloroform	67-66-3	<170*	170
1,2-Dichloroethane	107-06-2	<170*	170
2-Butanone	78-93-3	1,200	330
1,1,1-Trichloroethane	71-55-6	<170*	170
Carbon Tetrachloride	56-23-5	<170	170
Vinyl Acetate	108-05-4	<330	330
Bromodichloromethane	75-27-4	<170	170
1,2-Dichloropropane	78-87-5	<170	170

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83172D

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<170	170
Trichloroethene	79-01-6	5,300	170
Dibromochloromethane	124-48-1	<170	170
1,1,2-Trichloroethane	79-00-5	<170*	170
Benzene	71-43-2	410	170
cis-1,3-Dichloropropene	10061-01-5	<170	170
2-Chloroethylvinylether	110-75-8	<330	330
Bromoform	75-25-2	<170	170
4-Methyl-2-Pentanone	591-78-6	9,900	330
2-Hexanone	108-10-1	<330	330
Tetrachloroethene	127-18-4	650	170
1,1,2,2-Tetrachloroethane	79-34-5	<170	170
Toluene	108-88-3	680,000	170
Chlorobenzene	108-90-7	<170	170
Ethylbenzene	100-41-4	48,000	170
Styrene	100-42-5	<170	Ĩ70
Total Xylenes		1,400,000	170

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill Verified: K. Kline

Date Reported: November 2, 1988

Respectfully submitted,

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street

Griffith, IN 46319-0270

Client Sample Identification:

B-11 (5)/5K-2

Sample Matrix:

Soil

Date Sample Collected:
Date Sample Received:
Date Sample Analyzed:

October 5, 1988 October 6, 1988

October 24, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83172F

		oncentration	Quantitation
Analyte	CAS Number	(ug/kg)	Limit (ug/kg)
Chloromethane	74-87-3	<420	420
Bromomethane	74-83-9	<420	420
Vinyl Chloride	75-01-4	<420	420
Chloroethane	75-00-3	<420	420
Methylene Chloride	75-09-2	<210	210
Acetone	67-64-1	2,500	420
Carbon Disulfide	75-15-0	<210	210
1,1-Dichloroethene	75-35-4	<210	210
1,1 Dichloroethane	75-35-3	<210	210
Trans-1,2-Dichloroethene	156-60-5	<210	210
Chloroform	67-66-3	<210	210
1,2-Dichloroethane	107-06-2	<210	210
2-Butanone	78-93-3	2,100	420
1,1,1-Trichloroethane	71-55-6	<210	210
Carbon Tetrachloride	56-23-5	<210	210
Vinyl Acetate	108-05-4	<420	420
Bromodichloromethane	75-27-4	<210	210
1,2-Dichloropropane	78-87-5	<210	210

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83172F

		Concentration	Quantitation
Analyte	CAS Number	(ug/kg)	Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<210	210
Trichloroethene	79-01-6	<210	210
Dibromochloromethane	124-48-1	<210	210
1,1,2-Trichloroethane	79-00-5	<210	210
Benzene	71-43-2	210	210
cis-1,3-Dichloropropene	10061-01-5	<210	210
2-Chloroethylvinylether	110-75-8	<420	420
Bromoform	75-25-2	<210	210
4-Methyl-2-Pentanone	591-78-6	20,000	420
2-Hexanone	108-10-1	<420*	420
Tetrachloroethene	127-18-4	<210*	210
1,1,2,2-Tetrachloroethane	79-34-5	<210	210
Toluene	108-88-3	110,000	210
Chlorobenzene	108-90-7	<210	210
Ethylbenzene	100-41-4	11,000	210
Styrene	100-42-5	<210	210
Total Xylenes		28,000	210

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill Verified: K. Kline

Date Reported: November 2, 1988

Respectfully submitted,

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street

Griffith, IN 46319-0270

Client Sample Identification:

B-11 (7.5) /SK-Z

Sample Matrix:

Soil

Date Sample Collected:
Date Sample Received:

October 5, 1988

Date Sample Received:

Date Sample Analyzed:

October 6, 1988 October 24, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83172G

		Concentration	Quantitation
Analyte	CAS Number	(ug/kg)	Limit (ug/kg)
Chloromethane	74-87-3	<140	140
Bromomethane	74-83-9	<140	140
Vinyl Chloride	75-01-4	<140	140
Chloroethane	75-00-3	<140	140
Methylene Chloride	75-09-2	< 69	69
Acetone	67-64-1	<140*	140
Carbon Disulfide	75-15-0	< 69	69
1,1-Dichloroethene	75-35-4	< 69	69
1,1 Dichloroethane	75-35-3	< 69	69
Trans-1,2-Dichloroethene	156-60-5	< 69	69
Chloroform	67-66-3	< 69	69
1,2-Dichloroethane	107-06-2	< 69	69
2-Butanone	78-93-3	<140*	140
1,1,1-Trichloroethane	71-55-6	< 69	69
Carbon Tetrachloride	56-23-5	< 69	69
Vinyl Acetate	108-05-4	<140	140
Bromodichloromethane	75-27-4	< 69	69
1,2-Dichloropropane	78-87-5	< 69	69

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83172G

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6		69
Trichloroethene	79-01-6	< 69	69
Dibromochloromethane	124-48-1	< 69	69
1,1,2-Trichloroethane	79-00-5	< 69	69
Benzene	71-43-2	< 69	69
cis-1,3-Dichloropropene	10061-01-5	< 69	69
2-Chloroethylvinylether	110-75-8	<140	140
Bromoform	75-25-2	< 69	69
4-Methyl-2-Pentanone	591-78-6	<140*	140
2-Hexanone	108-10-1	<140	140
Tetrachloroethene	127-18-4	< 69	69
1,1,2,2-Tetrachloroethane	79-34-5	< 69	69
Toluene	108-88-3	430	69
Chlorobenzene	108-90-7	< 69	69
Ethylbenzene	100-41-4	320	69
Styrene	100-42-5	< 69*	69
Total Xylenes		1,100	69

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill Verified: K. Kline

Date Reported: November 2, 1988

Respectfully submitted,

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street

Griffith, IN 46319-0270

Client Sample Identification:

B-11 (10)/SK-Z

Sample Matrix:

Soil

Date Sample Collected: October 5, 1988 Date Sample Received: October 6, 1988
Date Sample Analyzed: October 26, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83172H

• • •		concentration	Quantitation
Analyte	CAS Number	(ug/kg)	Limit (ug/kg)
Chloromethane	74-87-3	<27	27
Bromomethane	74-83-9	<27	27
Vinyl Chloride	75-01-4	<27	27
Chloroethane	75-00-3	<27	27
Methylene Chloride	75-09-2	13	13
Acetone	67-64-1	<27*	27
Carbon Disulfide	75-15-0	<13	13
1,1-Dichloroethene	75-35-4	<13	13
1,1 Dichloroethane	75-35-3	<13	13
Trans-1,2-Dichloroethene	156-60-5	<13	13
Chloroform	67-66-3	<13	13
1,2-Dichloroethane	107-06-2	<13	13
2-Butanone	78-93-3	<27*	. 27
1,1,1-Trichloroethane	71-55-6	<13	13
Carbon Tetrachloride	56-23-5	<13	13
Vinyl Acetate	108-05-4	<27	27
Bromodichloromethane	75-27-4	<13	13
1,2-Dichloropropane	78-87-5	<13	13

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83172H

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<13	13
Trichloroethene	79-01-6	<13	13
Dibromochloromethane	124-48-1	<13	13
1,1,2-Trichloroethane	[₹] 79 - 00-5	<13	13
Benzene	71-43-2	<13	13
cis-1,3-Dichloropropene	10061-01-5	<13	13
2-Chloroethylvinylether	110-75-8	<27	27
Bromoform	75-25-2	<13	13
4-Methyl-2-Pentanone	591-78-6	<27	27
2-Hexanone	108-10-1	<27	27
Tetrachloroethene	127-18-4	<13	13
1,1,2,2-Tetrachloroethane	79-34-5	<13	13
Toluene	108-88-3	17	13
Chlorobenzene	108-90-7	<13	13
Ethylbenzene	100-41-4	<13	13
Styrene	100-42-5	<13	13
Total Xylenes		<13	13

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill Verified: K. Kline

Date Reported: November 2, 1988

Respectfully submitted,

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street

Griffith, IN 46319-0270

Client Sample Identification:

B-9 (2.5) /5K-4

Sample Matrix:

Soil

Date Sample Collected:

October 4, 1988 October 6, 1988

Date Sample Received: Date Sample Analyzed:

October 6, 1988 October 21, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83172A

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Analyte			
Chloromethane	74-87-3	<44	44
Bromomethane	74-83-9	<44	44
Vinyl Chloride	75-01-4	<44.	44
Chloroethane	75-00-3	<44	4.4
Methylene Chloride	75-09-2	110	22
Acetone	67-64-1	5,600	44
Carbon Disulfide	75-15-0	<22	22
1,1-Dichloroethene	75-35-4	<22	22
1,1 Dichloroethane	75-35-3	<22	22
Trans-1,2-Dichloroethene	156-60-5	<22*	22
Chloroform	67-66-3	<22	22
1,2-Dichloroethane	107-06-2	<2Ž	22
2-Butanone	78-93-3	740	44
1,1,1-Trichloroethane	71-55-6	<22	22
Carbon Tetrachloride	56-23-5	<22	22
Vinyl Acetate	108-05-4	<44	44
Bromodichloromethane	75-27-4	<22	22
1,2-Dichloropropane	78-87-5	<22	22

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83172A

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<22	22
Trichloroethene	79-01-6	<22*	22
Dibromochloromethane	124-48-1	<22	22
1,1,2-Trichloroethane	79-00-5	<22	22
Benzene	71-43-2	24	22
cis-1,3-Dichloropropene	10061-01-5	<22	22
2-Chloroethylvinylether	110-75-8	<44	44
Bromoform	75-25-2	<22	22
4-Methyl-2-Pentanone	591-78-6	3,600	44
2-Hexanone	108-10-1	<44*	44
Tetrachloroethene	127-18-4	<22	22
1,1,2,2-Tetrachloroethane	79-34-5	<22	22
Toluene	108-88-3	58,000	22
Chlorobenzene	108-90-7	<22	22
Ethylbenzene	100-41-4	1,500	22
Styrene	100-42-5	<22	22
Total Xylenes		22,000	22

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill Verified: K. Kline

Date Reported: November 2, 1988

Respectfully submitted,

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319-0270

B-10 (2.5)/sk-5 Client Sample Identification:

Sample Matrix:

Soil

Date Sample Collected: Date Sample Received:

October 4, 1988 October 6, 1988

Date Sample Analyzed:

October 21, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83172B

		Concentration	Quantitation
Analyte	CAS Number	(ug/kg)	Limit (ug/kg)
Chloromethane	74-87-3	<280	280
Bromomethane	74-83-9	<280	280
Vinyl Chloride	75-01-4	<280	280
Chloroethane	75-00-3	<280	280
Methylene Chloride	75-09-2	<140	140
Acetone	67-64-1	1,400,000	280
Carbon Disulfide	75-15-0	<140	140
1,1-Dichloroethene	75-35-4	<140	140
1,1 Dichloroethane	75-35-3	<140	140
Trans-1,2-Dichloroethene	156-60-5	<140	140
Chloroform	67-66-3	<140	140
1,2-Dichloroethane	107-06-2	<140	140
2-Butanone	78-93-3	1,600	280
1,1,1-Trichloroethane	71-55-6	<140	140
Carbon Tetrachloride	56-23-5	<140	140
Vinyl Acetate	108-05-4	<280	280
Bromodichloromethane	75-27-4	<140	140
1,2-Dichloropropane	78-87-5	<140	140

^{*} Analyte detected but amount present is less than the Quantitation Limit.

2 of 2 ANALYTICAL RESULTS

ATEC Lab No. 83172B

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<140	140
Trichloroethene	79-01-6	<140*	140
Dibromochloromethane	124-48-1	<140	140
1,1,2-Trichloroethane	79-00-5	<140	140
Benzene	71-43-2	<140*	140
cis-1,3-Dichloropropene	10061-01-5	<140	140
2-Chloroethylvinylether	110-75-8	<280	280
Bromoform	75-25-2	<140	140
4-Methyl-2-Pentanone	591-78-6	12,000	280
2-Hexanone	108-10-1	<280	280
Tetrachloroethene	127-18-4	<140*	140
1,1,2,2-Tetrachloroethane	79-34-5	<140	140
Toluene	108-88-3	390,000	140
Chlorobenzene	108-90-7	<140	. 140
Ethylbenzene	100-41-4	57,000	140
Styrene	100-42-5	<140	140
Total Xylenes		290,000	140

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill Verified: K. Kline

Date Reported: November 2, 1988

Respectfully submitted,

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street

Griffith, IN 46319-0270

Client Sample Identification: B-8 (2.5) / Sk-6

Soil

Sample Matrix:

Date Sample Collected: October 4, 1988
Date Sample Received: October 6, 1988
Date Sample Analyzed: October 21, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83172C

_		oncentration	Quantitation
Analyte	CAS Number	(ug/kg)	Limit (ug/kg)
Chloromethane	74-87-3	<77	77
Bromomethane	74-83-9	<77	77
Vinyl Chloride	75-01-4	<77	77
Chloroethane	75-00-3	<77	77
Methylene Chloride	75-09-2	<38	38
Acetone	67-64-1	<77*	. 77
Carbon Disulfide	75-15-0	<38	38
1,1-Dichloroethene	75-35-4	<38	38
1,1 Dichloroethane	75-35-3	<38	38
Trans-1,2-Dichloroethene	156-60-5	<38	38
Chloroform	67-66-3	<38	38
1,2-Dichloroethane	107-06-2	<38	38
2-Butanone	78 -93-3	<77*	77
1,1,1-Trichloroethane	71-55-6	<38	38
Carbon Tetrachloride	56-23-5	<38	38
Vinyl Acetate	108-05-4	<77	77
Bromodichloromethane	75-27-4	<38	38
1,2-Dichloropropane	78-87-5	<38	38

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83172C

Analyte	CAS Number	Concentration (ug/kg)	Quantitation Limit (ug/kg)
Trans-1, 3-Dichloropropene	10061-02-6	<38	38
Trichloroethene	79-01-6	<38	38
Dibromochloromethane	124-48-1	<38	38
1,1,2-Trichloroethane	79-00-5	<38	38
Benzene	71-43-2	<38	38
cis-1,3-Dichloropropene	10061-01-5	<38	38
2-Chloroethylvinylether	110-75-8	<77	77
Bromoform	75-25-2	<38	38
4-Methyl-2-Pentanone	591-78-6	<77	77
2-Hexanone	108-10-1	<77	77
Tetrachloroethene	127-18-4	<38	. 38
1,1,2,2-Tetrachloroethane	79-34-5	<38	38
Toluene	108-88-3	45	38
Chlorobenzene	108-90-7	<38	38
Ethylbenzene	100-41-4	<38*	38
Styrene	100-42-5	<38	38
Total Xylenes		<38*	38

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: SW 846 Method 8240

Analyst: M. McGill Verified: K. Kline

Date Reported: November 2, 1988

Respectfully submitted,

REPORT OF TEST RESULTS

ATEC Project Number 52-83217

DATE:

October 13, 1988

CLIENT:

ATEC Associates, Inc. ATTN: John McBride 1501 East Main Street Griffith, IN 46319

SAMPLE IDENTIFICATION:

Safety Kleen

SAMPLE MATRIX:

Soil

SAMPLE TAKEN BY:

ATEC (AR)

DATE COLLECTED:

October 4 and 5, 1988

DATE RECEIVED:

October 6, 1988

ANALYST

KEB, AJB

Parameter		Samp	le I.D.	Number	· .		SW 846
(units in mg/kg unless noted)	<u>B-9</u> sk-4	B-10 SE-5	B-8 5k-6	B-11 SK-2	B-12 Sk-1	MDL*	Analytical Method No.
Total Metals	> F-7		, – –	<i>3</i> F C	>F-1		
Arsenic	9.0	9.3	8.0	6.7	7.8	1.0	7061
Barium	40	41	47	28	44	5.0	7080
Cadmium	<0.5	<0.5	0.6	<0.5	0.6	0.5	7130
Chromium	1.2	1.3	1.4	7.9	12	0.5	7190
Lead	5.7	9.5	13	3.4	26	0.5	7420
Mercury	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	7470
Selenium	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7741
Silver	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	7760

^{*} Method Detection Limit

Respectfully submitted, ATEC Associates, Inc.

CHAIN OF CUSTODY RECORD Softon IL Facility PROJ. NO. 8-3217 NO. SAMPLERS: (signosuro) OF. REMARKS CON-TAINERS STATION LOCATION STA. NO. DATE TIME 25 from 2.5' 10/4/84 11:00 deis 10 0/4/18 1:00 10/4/1/2 2 100 .1 W/5/18 9:00 Bolina 11 • f BUMS 145/8/11:00 12 41 195/10/9:00 from • 0/5/8/9/100 4:4)c 10' N2/884:00 " 8 6. Date / Time Relinquished by: (Signature) Date / Time Received by: (Signature) Relinquished by: (Signature) Received by: (Signature) 10/5/88 416 Date / Time Date / Time Received by: (Signature) Received by: (Signature) Relinquished by: (Signature) Relinquished by: (Signature) Received for Laboratory by: Date / Time Date / Time Remarks Relinquished by: (Signature) 10/6/80 10:37Am

APPENDIX II-D-2

JANUARY 1990 INVESTIGATION

NORTH

HA - HAND AUGER SPAPLE

A- ASBESTOS SAMPLE

T- TRANSFORMER SAMPLE

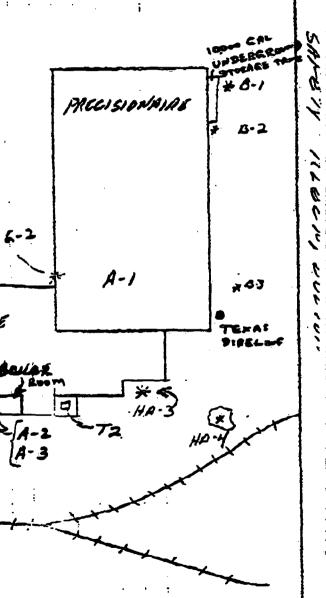
B- BORING LOCATION

HAI

HA-20

G- GRAB SAMPLE

A



** TOTAL PAGE. 914 **



TEI ANALYTICAL, INC.

7177 NORTH AUSTIN . NILES. ILLINOIS . 50545 . 708/547-1348

LABORATORY REPORT

Wang Engineering Inc. 1000 Hewthorne Drive Icasca, 1L 60143

Attn: Jerry Wang

SAMPLE

RECEIVED: 01-09-90 0800

TEI NO. 71290 SAMPLE IDENTIFICATION: TEST T. Rec. Pet. Hydracarbons PCB Volatiles (8240) Performed on Ruch Basis	HA28-C1 RESULT 1410. <0.5 see attached	mqq maq	DAIE PERFORMED 01-11-90 01-11-90 01-10-90
TEI NO. 71291 SAMPLE IDENTIFICATION: TEST T. Red. Pet. Hydrocarbons PC8 Volatiles (8240) Performed on Rush Basis	HA3-G1 RESULI 810. <0.5 see attached	maa maa	DATE PERFORMED 01-11-90 01-11-90 01-10-90
TEI NO. 71292 SAMPLE IDENTIFICATION: TEST T. Rec. Pet. Hydrocerbons PC8 Volatiles (8240) Performed on Rush Bosis	HA4-C1 BESULI <100. <0.5 see attached	ppr ppm	<u>DATE PERFORMED</u> 01-11-90 01-11-90 01-10-90

Project 313-0.5 \$&K Dalton

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Gayle E. Marks. Ph.D.



TEI ANALYTICAL, INC.

7177 NORTH AUSTIN . NILES, ILLINOIS . 50648 . 708/847-1948

LABORATORY REPORT

Wang Engineering Inc. 1000 Hawthorns Drive Itasca, IL 60143

Attn: Jerry Wang		RECEIVED:	01-09-90 0600
TEI NO. 71287 SAMPLE IDENTIFICATION: IESI T. Rec. Pet. Hydrocarbons PCB Volatiles (8240) Performed on Rush Basis	81 33 <u>RESULT</u> 270. <0.5 500 etteched	wed wed	DATE PERFORMED 01-11-90 01-09-90 01-10-90
TEI NO. 71288 SAMPLE IDENTIFICATION: TEST T. Rec. Pet. Hydrocarbons PCS Velatiles (8240) Performed on Rush Bosis	83 \$2 RESULI <100. <0.5 see attached	ggm ppm	DATE PERFORMED 01-11-90 01-09-90 01-16-90
TEI NO. 71289 SAMPLE IDENTIFICATION: TEST T. Rec. Pat. Hydrocarbons PC8 Voletiles (8249)	HAI-CI RESULT <100. <0.5	ppm ppm	<u>DATE PERFORMED</u> 01-11-90 01-09-90 01-10-98

Project 313-0.5 S&K Dalton

Performed on Rush 83516

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Gayla E. Marks, Ph.O.



LABORATORY REPORT

Volutiles

All results expressed as ppm unless otherwise indicated. LT \approx Less Than

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	TEI-71287 8-1 6-3	TE1-71288 8-3 5-2	TEI-71289 HA-1 C1
Senzene	LT D.01	LT 0.01	LT 5.01
Teluene	LT 0.01	LT 0.01	LT 0.01
Ethyl Banzens	LT 0.01	LT 0.01	LT 0.01
Carbontetraphlorida	LT 0.01	LT D.01	LT 0.01
Ghlorobanzeno	LT 0.01	LT 0.01	LT Q.Q1
1,2 Dichlorosthame	LT 0.01	LT 0.01	LT 0.01
1,1,1 Trichloresthene	LT 0.01	LT 0.01	LT 0.01
1,1 Dichloroathanc	LT 0.01	LT 0.01	LT 0.01
1,1 Dichlerosthylane	LT 0.01	LT 0.01	LT Q.01
1,1,2 Trichloroethone	LT 0.01	LT 5.01	LT D.01
1,1,2,2 Tetrachlorocthane	LT 0.01	LT 0.01	LT 0.01
Chlerethane	LT 0.01	LT 0.01	LT 0.01
2 Chloroathyl vinyl esher	LT 8.01	LT 0.01	LT 0.01
Chloreform	LT 0.01	LT 0.01	LT 0.01
1,2 Dichleroprepana	LT 0.01	L7 0.01	LT 0.01
1,3 Dichleropropone	LT 0.01	LT 0.01	LT 0,01
Mathylana Chlerida	LT 0.01	LT 0.01	LT 0.01
Methyl Chlorida	LT 8.01	LT 3.01	LT 0.01
Methyl Bromide	LT 0.01	LT Q.01	LT 0.01
Bromoform	LT 0.01	LT 0.01	LT 0.01
Dicklorobromomethane	LT 0.01	LT 0.01	LT 0.01
Trichlorofiuoromathene	LT 0.01	LT 0.01	LT 0.81
Chlorodibromometham	LT 0.01	LT 9.01	LT 0.01
Dichlorodifluoromathene	LT 0.01	LT 5.01	LT 0.01
Tetrachlorocahylena	LT 0.01	LT 0.01	LT 0.01
Trichlorosthylang	LT 0.01	LT 0.01	LT 0.01
Vinyl Chloride	LT 0.01	LT 0.01	LT 0.01
1,2 a Dishleresthylene	LT 0.01	LT 0.01	LT 0.04
bis[chloromethyl]ether	LT 0.01	LT 0.01	LT 0.01
Xylanes	LT 0.01	Lr 2.01	LT 0.01
Hexano	LT 0.01	LT 0.04	LT Q.01

Goyle E. Menke, Ph.D.



LABORATORY REPORT

Voiatiles

All results expressed as ppm unless otherwise indicated. LT = Loss Than
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		12-71250 1-3 85-AH	TEI-71291 HA-3 G-1	TEI-71292 HA-4 C-1
	Bonzene	LT 0.01	LT 0.01	LT 0.01
	Telusna	LT 0.01	LT 0.01	LT 0.01
	Ethyl Benzena	LT '0.01	LT 0.01	LT 0.01
	Çarbontetrechloride	LT 0.01	LT 0.01	LT 0.01
	Chlerebenzene	LT 0,01	LT 0.01	LT 0.01
	1,2 Dichloroethens	LT 0.01	LT 0.Q1	LT 0.01
•	1,1,1 Trichloresthans	LT 0.01	LT 0.01	LT 0.01
,	1,1 Dichloroethane	LT 0.01	LT 0.01	LT 0.01
	1,1 Dichlorosthylene	LT 0.01	LT 0.01	LT Q.01
	1,1,2 Trichloresthans	LT 0.01	LT 0.01	LT 0.01
	1,1,2,2 Tetrachlorosthans	LT 0.01	LT 0.01	LT 0.01
	Chloroothane	LT 0.01	LT 0.01	LT 0.01
	2 Chiorosthy) vinyl sther	LT 0.01	LT 0.01	LT 0.01
	Chloraform	LT 0.01	LT 0.01	LT 0.01
	1,2 Dichloropropane	LT Q.01	`LT 0.01	LT 0.01
	1,3 Dichloropropene	LT 0.01	LT 5.01	LT 0.01
	Mathylane Chlorida	LT Q-01	LT Q.01	LT 0.01
	Methyl Chloride	LT 0.01	LT 0.01	LT 0.01
	Methyl Bromide	LT 0.01	LT 0.01	LT 0.01
	Bromoform	LT 0.01	LT 0.01	LT 0.01
	Dichlerobramomethens	LT 0.01	LT 0.01	LT 0.01
	Trichlorefluoremethens	LT 0.01	LT 0.01	LT 0.01
	Chierodibromemethane	LT 0.01	LT 0.01	LT 0.01
	Dichloredifluoromethene	LT 0.01	LT 0.01	LT U.01
	Tetrachlorosthylene	LT 0.01	LT 0.01	LT 0.01
	Trichloroethylene	LT 0.01	LT D.G1	LT 0.01
	Vinyl Chloride	LT 0.01	LT 0.01	LT 0.01
	1,2 t Dichloresthylene	LT 0.01	LT 0.01	LT U.01
	bis(chloromethyl)ether	LT Q.01	'_T 3.01	LT U.01
	Xylones	LT 0.01	LT 0.01	LT 0.01
	Hexane	LT 0.01	LT 0.01	LT 0.01

01/15/90 15:41

2312 847 0844

TEI ANALYTICAL

--- WANG ENGINEERING

Ø 902



TEST

IESI

PCB

PCB

TEI ANALYTICAL, INC.

7177 NORTH AUSTIN - NILES, ILLINGIS - 60648 - 708/647-1345

LABORATORY REPORT

Wang Engineering Inc. 1000 Hawthorne Drive Itasca, IL 60143

Accn: Jerry Wang

SAMPLE

RECEIVED:

01-12-90 0800

TEI NO. 71437

SAMPLE IDENTIFICATION:

T-1 RESULT <0.5

D Dm

DATE PERFORMED

01-13-90

Performed on Ruch Basis

TEI NO. 71438

SAMPLE IDENTIFICATION:

7-2

BESULI

<0.5

ppm

DATE PERFORM

Performed on Rush Basis

Project 313-05

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PAGE.013/014

. 01/15/90 15:42

2312 847 9844

TEI ANALYTICAL

WANG ENGINEERING

@ 003



TEST

7177 NORTH AUSTIN . NILES, ILLINOIS . 60648 . 708/647-1345

January 12, 1990

LABORATORY REPORT

r #4248 Page 5 of 5 pages:

Wang Engineering Inc. 1008 Hawthorne Drive Itasca, IL 60143

Jarry Wang Attn:

SAMPLE

RECEIVED: 01-09-90 0800

TEI NO. 71293

SAMPLE IDENTIFICATION:

RESULI

<0.5

DOG

DATE PERFORMED

01-11-90

Performed on Rush 88818

APPENDIX II-D-3

AUGUST 1990 INVESTIGATION UNDERGROUND STORAGE TANKS

TABLE 1

SAFETY-KLEEN - DOLTON, ILLINOIS

SOIL ANALYTICAL RESULTS

SAMPLE LOCATION	Benzene	Toluene	Ethyl benzene	Xylenes	Total BTEX
	<25	<25	<25	23J	BDL
10,000 gal North 10,000 gal South	₹	< <u>5</u>	₹	<i>2</i> 3	BDL
10,000 gal East	<5	<5	<5	5	5
10,000 gal West	<5	<5	<5	<5	BDĻ
10,000 gal Bottom	<25	<25	<25	20J	BDL
10,000 gal S.S.	<5	<5	<5	<5	BDL
IEPA Guidelines	25	*	*	+	16,025

TABLE 2

SAFETY-KLEEN - DOLTON, ILLINOIS

SOIL ANALYTICAL RESULTS

SAMPLE			Ethyl		Total
LOCATION	Benzene	Toluene	benzene	Xylenes	BTEX
15,000 gal North	<25	<25	<25	<25	BDL
15,000 gal South	<25	<25	<25	<25	BDL
15,000 gal East	<25	<25	<25	<25	BDL
15,000 gal West	<25	<25	<25	<25	BDL
15,000 gal Bottom	<25	<25	<25	<25	BDĻ
15,000 gal S.S. #1	<25	<25	<25	15J	BDL
15,000 gal S.S. #2	<25	<25	13J	190	BDL
IEPA Guidelines	25	*	*	*	16,025

S.S - Soil Stockpile

Concentrations in ppb (ug/kg)

- * Included in calculation for Total BTEX
- J The concentration listed is an estimated value which is less than the specified minimum detection limit but is greater than zero.

BDL - Below detection limit





REPORT TRANSMITTAL

REPORT NUMBER ___CH901155

DATE ___August 30,1990

CLIENT

GROUNDWATER TECHNOLOGY 2200 N. Stonington Ave.

Suite 160

Hoffman, Estates, IL 60195

ATTENTION ___

John McBride

The above referenced report is enclosed. Copies of this report and supporting data will be retained in our files in the event they are required for future reference.

If there are any questions concerning this report, please do not hesitate to contact us.

Any samples submitted to our Laboratory will be retained for a maximum of sixty (60) days from receipt of this report, unless other arrangements are desired.

126 WEST CENTER COURT • SCHAUMBURG, ILLINOIS 60195 • (708) 705 0740



August 30, 1990

CH901155
GROUNDWATER TECHNOLOGY
2200 N. Stonington Ave.
Suite 160
Hoffman Estates, IL 60195

ATTENTION: John McBride

PURPOSE AND RESULTS

Two (2) soil samples were received on August 14, 1990 by York Laboratories of Chicago. These samples were analyzed, as received, for the requested volatile compounds, utilizing EPA approved methodologies. All analyses were performed within the recommended holding times.

Results are presented in the following tables with chain-of custody documentation included as an appendix.

DATA RELEASE AUTHORIZED BY:

Mark A. Hartwig President

OUALIFIERS

- U Indicates that the compound was analyzed for but not detected.
- J Indicates that the compound was analyzed for and determined to be present in the sample. The mass spectrum of the compound meets the identification criteria of the method. The concentration listed is an estimated value which is less than the specified minimum detection limit but is greater than zero.
- B This flag is used when the analyte is found in the blanks as well as the sample. It indicates possible sample contamination and warns the data user to use caution when applying the results of this analyte.
- D Sample extract was diluted by the factor listed due to the sample matrix and/or concentration levels. All method lower limits of detection for this sample are necessarily increased by this dilution factor.

JOB NO. CH901155

BTEX COMPOUND LIST ug/kg

VS0820 BOTTOM 1155- 002			of Detection (LLD) with no Dilution*
1155-			no bilucion*
		ł	
UD	_		5
UD			5
20J			5
UD			5
	20J	20J	20J

^{*}MDL (Minimum Detection Limit) = LLD x DF

YORK LABORATORIES CHAIN OF CUSTODY RECORD

CLIENT ID: Story Klien -									YORK JOB #: <u>UPP01155</u>	
CLIENT PROJ. ID:		P-5	1	SAMPLE BOT	ITLE DESCRIPTI	ONS		ı		
FOR CLIE SAMPLE ID SET (12 Characters)			 } 	}] 	 	; 	I I I I TOTAL I BOTTLES	COMMENTS
N-Side Soil	8 4 90 8 14 90 1 1 1 1 1 1 1 1 1 1	1/55-00 EPA 1/55-00 EPA	8243 824° 							BTEX ONE
* NOTE : For Lab Use Only	22222222222222	REF. # :								= TOTAL # OF BOTTLES
SIGNATURE:	Klinger Klinger	DATE: 8 114120 COOLER SEALED ? SEAL #:	TIME: YES	<u>5 20 </u> NO	I CUSTODY TRAI	nsferred to Signaturi			_ DATE:/_	_/ TIME::
COOLER OPENED BY: SIGNATURE:		DATE:/_/ SEAL INTACT ? Y SEAL #:	TIME: ES NO		II COOLER RE-SEALED BY:					
SAMPLES COLLECTED BY: SIGNATURE:		DATE:/_/ SAMPLES SEALED?	TIME:		RECEIVED IN	LAB BY:	La Orti	thy siders	DATE: 8 1/2 SEAL INTACT SEAL #:	7190 TIME: 5: ? YES NO
WERE SOMELES SPLIT WITH ANOTHER	PARTY? III YES	######################################		=======================================	2252222222		22.2x52351	(RESE 20082220000000000000000000000000000000	======================================	#2822#################################

COOLER ID:

WERE SOMELES SPLIT WITH ANOTHER PARTY?

IF YES IDENTIFY:



REPORT TRANSMITTAL

REPORT NUMBER CH901150

DATE September 4, 1990

CLIENT

GROUNDWATER TECHNOLOGY 2200 N. Stonington Ave.

Suite 160

Hoffman, Estates, IL 60195

ATTENTION __ John McBride

The above referenced report is enclosed. Copies of this report and supporting data will be retained in our files in the event they are required for future reference.

If there are any questions concerning this report, please do not hesitate to contact us.

Any samples submitted to our Laboratory will be retained for a maximum of sixty (60) days from receipt of this report, unless other arrangements are desired.



September 4, 1990

CH901150
GROUNDWATER TECHNOLOGY
2200 N. Stonington Ave.
Suite 160
Hoffman Estates, IL 60195

ATTENTION: John McBride

PURPOSE AND RESULTS

Four (4) soil samples were received on August 14, 1990 by York Laboratories of Chicago. These samples were analyzed, as received, for the requested volatile compounds, utilizing EPA approved methodologies. All analyses were performed within the recommended holding times.

Results are presented in the following tables with chain-of custody documentation included as an appendix.

DATA RELEASE AUTHORIZED BY:

Mark A. nar President

QUALIFIERS

- U Indicates that the compound was analyzed for but not detected.
- J Indicates that the compound was analyzed for and determined to be present in the sample. The mass spectrum of the compound meets the identification criteria of the method. The concentration listed is an estimated value which is less than the specified minimum detection limit but is greater than zero.
- B This flag is used when the analyte is found in the blanks as well as the sample. It indicates possible sample contamination and warns the data user to use caution when applying the results of this analyte.
- D Sample extract was diluted by the factor listed due to the sample matrix and/or concentration levels. All method lower limits of detection for this sample are necessarily increased by this dilution factor.

BTEX COMPOUND LIST ug/kg

Dilution Factor (DF)	1.0	1.0	1.0	1.0		Lower Limits of Detection
Method Blank	VS0820	VS0820	VS0820	VS0820		(LLD) with no Dilution*
Client I.D.	METHOD BLANK	E-SIDE	W-SIDE	s-sidë	·	no bilación.
Compound Lab I.D.	VS0820	1150- 001	1150- 002	1150- 003		
Benzene	U	U	U	U		5
Toluene	U	U	Ü	ט		5_
Xylene	U	5_	U	U		5
Ethylbenzene	Ū	Ŭ	<u>"</u>	Ü		5
<u></u>						
			ļ	·		

*MDL (Minimum Detection Limit) = LLD x DF

IENT GROUNDWATER TECHNOLOGY

B NO. CH901150

SOIL

BTEX COMPOUND LIST ug/kg

Dilution Factor (DF)	1.0	1.0		Lower Limits
Method Blank	VS0814	VS0814		of Detection (LLD) with
Client I.D.	METHOD BLANK	SOIL PILE		no Dilution*
Compound Lab I.D.	VS0814	1150- 004		
Benzene	ַ ט	U		 5
Toluene	U	U		5
Xylene	Ü	Ü		5
Ethylbenzene	U	U		5

^{*}MDL (Minimum Detection Limit) = LLD x DF



REPORT TRANSMITTAL

CH901301 REPORT NUMBER _

DATE ___September 24, 1990

CLIENT

GROUNDWATER TECHNOLOGY 2200 N. Stonington Ave.

Suite 160

Hoffman, Estates, IL 60195

ATTENTION .

John McBride

The above referenced report is enclosed. Copies of this report and supporting data will be retained in our files in the event they are required for future reference.

If there are any questions concerning this report, please do not hesitate to

Any samples submitted to our Laboratory will be retained for a maximum of sixty (60) days from receipt of this report, unless other arrangements are desired.

126 WEST CENTER COURT • SCHAUMBURG, ILLINOIS 60195 • (708) 705 0740



September 24, 1990

CH901301
GROUNDWATER TECHNOLOGY
2200 N. Stonington Ave.
Suite 160
Hoffman Estates, IL 60195

ATTENTION: John McBride

PURPOSE AND RESULTS

Seven (7) soil samples were received on September 21, 1990 by York Laboratories of Chicago. These samples were analyzed, as received, for the requested volatile compounds, utilizing EPA approved methodologies. All analyses were performed within the recommended holding times.

Results are presented in the following tables with chain-of custody documentation included as an appendix.

DATA RELEASE AUTHORIZED BY:

Mark A. Hartwig President

QUALIFIERS

- U Indicates that the compound was analyzed for but not detected.
- J Indicates that the compound was analyzed for and determined to be present in the sample. The mass spectrum of the compound meets the identification criteria of the method. The concentration listed is an estimated value which is less than the specified minimum detection limit but is greater than zero.
- B This flag is used when the analyte is found in the blanks as well as the sample. It indicates possible sample contamination and warns the data user to use caution when applying the results of this analyte.
- D Sample extract was diluted by the factor listed due to the sample matrix and/or concentration levels. All method lower limits of detection for this sample are necessarily increased by this dilution factor.

CASE NARRATIVE

All samples were analyzed according to the appropriate protocol. Samples were diluted by five (5) because only 25 ppb PQL for benzene was needed and a 24 hour turn around time was requested.

SOIL

BTEX COMPOUND LIST ug/kg

Dilution Facto	or (DF)	1.0	5.0	5.0	5.0	5.0	Lower Limits of Detection
Method Blank		VS0924	VS0924	VS0924	VS0924	VS0924	(LLD) with no Dilution*
	Client I.D.	METHOD BLANK	NORTH WALL	EAST WALL	SOUTH WALL	SOIL PILE#1	no bilucion*
Compound	Lab I.D.	VS0924	1301 -001	1301 -002	1301 -003	1301 -004	
Benzene		U	UD	UD	ַ עט	UD	
Toluene		ប	UD	סט	UD	UD	5
Xylene		บ	UD	ŪD	UD	15J	5
Ethylbenzene		Ū	UD	UD	UD	UD	5
				<u>.</u>		·** =	

Dilution Fact	or (DF)	5.0	5.0	5.0			Tarram Timita
Method Blank		VS0924	VS0924	VS0924			Lower Limits of Detection
	Client I.D.	SOIL PILE#2	WEST WALL	BOTTOM			(LLD) with no Dilution*
Compound	Lab I.D.	1301 -005	1301 -006	1301 -007			
Benzene		UD	UD	מט			5
Toluene		UD	UD	ÜD			5
Xylene		190	UD	עט			5
Ethylbenzene		13J	UD	UD			5
	·				·.		
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^{*}MDL (Minimum Detection Limit) = LLD x DF

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APPENDIX II-E

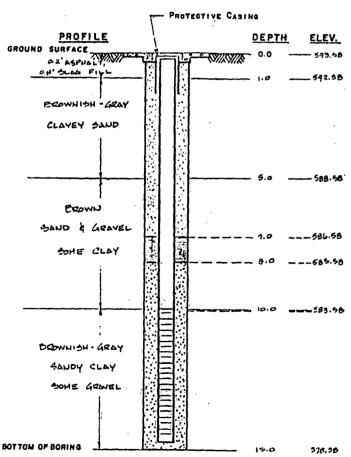
MONITORING WELL COMPLETION FORMS DOLTON RECYCLE CENTER

II-E-1 1983 INSTALLATIONS

II-E-2 1988 INSTALLATIONS

APPENDIX II-E-1
1983 INSTALLATIONS

MONITORING WELL DETAILS



HOTES

1. NOT DRAWN TO SCALE

2 DEPTH AND ELEVATION DATA IS

LEGEND

10/2/03 2-11" 390.45 10/19/02 2'-11" 590.41 11/2/03 2-3/2" 591.07 11/4/09 2'-10" 290.23

590.11

644.a

£19.0

512.0

511.0

509.0

508.a

DATE WATER LEVEL

TIME DEPTH ELEV.

3'. 5'

10/5/83

199/88

412/63

GROUND WATER LEVEL OBSERVATIONS

MONITORING WELL NO. _1__

ELEVATION

SUMMARY OF GROUND WATER LEVELS

19/26/63 (He REPORM)

DATE

172.05

19/9/05

COMMENTS

GENERAL NOTES

11/4/03

EPTH

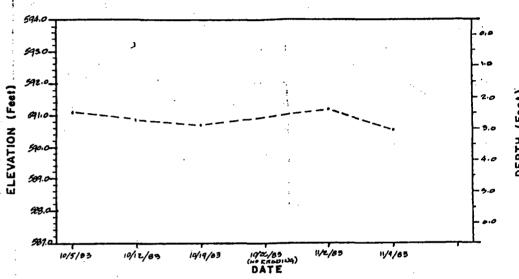
- 1. Monitoring Well installed on 7/21/83.
- Under "Ground Water Observations", water depths reported are from top of casing.
- Under "Summary of Ground Water Levels", water depths reported are referenced to ground surface.

SALISBURY ENGINEERING / ATEC 1501 EAST MAIN STREET ... GRIFFITH, INDIANA

INSTALLATION DETAIL - MONITORING WELL NO. 1

MONITORING WELL DETAILS PROTECTIVE CASING PROFILE ELEY. GROUND SURFACE 0.2' 0501011 08' CRUSHED, SLAG GRAYISH - DARK BROWN GILTY SAND AND LRAVEL BROWN & GRAY 1 - Washington Or Co. CLAY SEAMS OF SAND DRUADIC BOTTOM OF BORING LEGEND NOTES . GROUT 1. NOT DRAWN TO SCALE BENTONITE 2. DEPTH AND ELEVATION DATA IS APPROXIMATE. GRANULAR BACKFILL 3. DEPTH AND ELEVATION IN PEET. SOIL

SUMMARY OF GROUND WATER LEVELS



GROUND WATER LEVEL OBSERVATIONS MONITORING WELL NO. 2

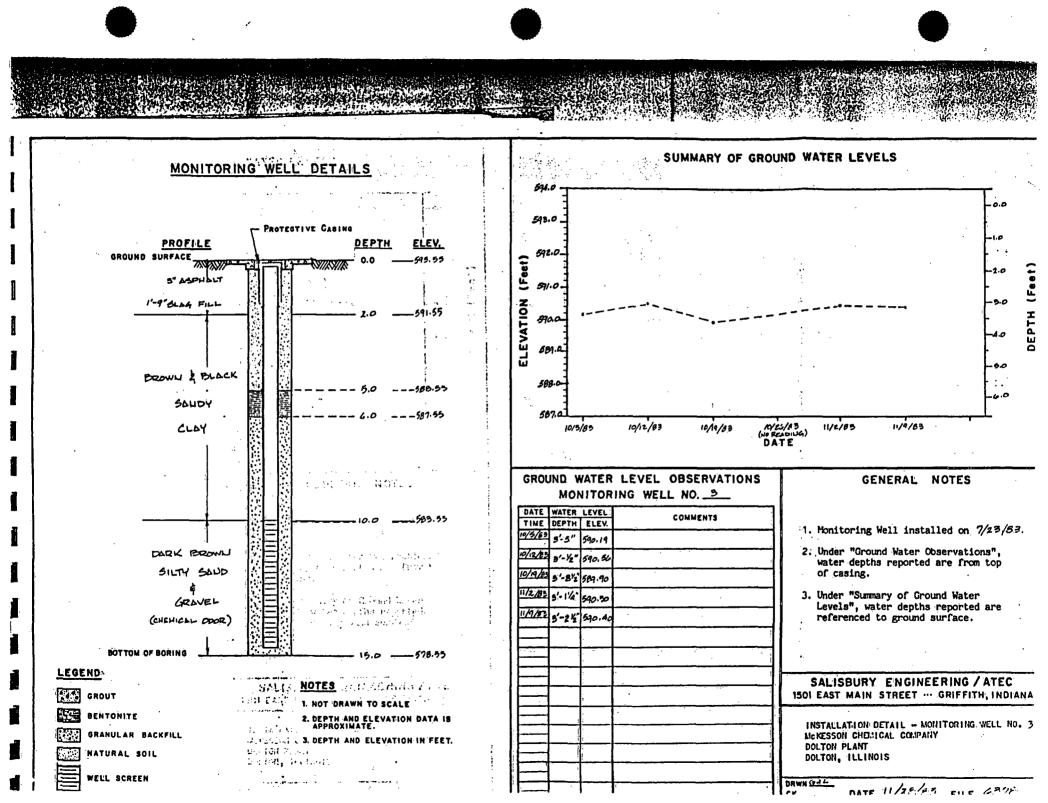
	WATER	LEVEL	COMMENTS
TIME	DEPTH	ELEV.	- Commercia
2/3/83	2(5"	541.11	
10/12/83	7.0	590.86	
10/19/69	2'-7%	540.74	
11/9/82	A. A.	571.20	
11/4/09	2'-1042	590.49	
	 		
		,	•

GENERAL NOTES

- 1. Monitoring Well installed on 7/22/85.
- 2. Under "Ground Water Observations", water depths reported are from top of casing.
- 3. Under "Summary of Ground Water Levels", water depths reported are referenced to ground surface.

SALISBURY ENGINEERING / ATEC 1501 EAST MAIN STREET ... GRIFFITH, INDIANA

INSTALLATION DETAIL - MONITORING WELL NO. 2 MCKESSON CHEMICAL COMPANY DOLTON PLANT DOLTON, ILLINOIS



MONITORING WELL DETAILS PROTECTIVE CASING PROFILE GROUND SURFACE 9" COARSE SLAG DARK BROWN & BLACK CLAYEY SAND BOTTOM OF BORING LEGEND Establish the You the NOTES TRACE GROUT 1. NOT DRAWN TO SCALE 2. DEPTH AND ELEVATION DATA IS COCTOS S. DEPTH AND ELEVATION IN FEET.

133 9 25

SUMMARY OF GROUND WATER LEVELS 544.0 545.0 100 540.0 100 540.0 1075/83

GROUND WATER LEVEL OBSERVATIONS MONITORING WELL NO. 4

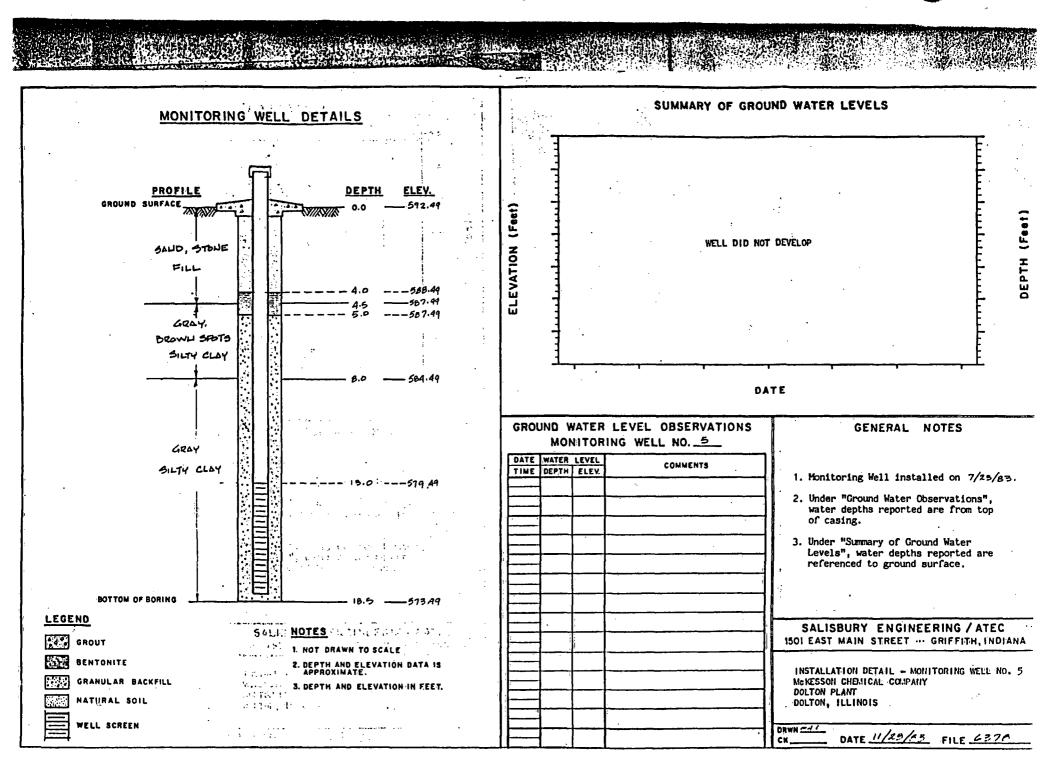
DATE WATER LEVEL TIME DEPTH ELEV. 0/5/5/92 3'-3" 590.21 0/12/63 2'-10" 590.23 10/14/52 2'-10" 590.23 11/4/85 2'-10" 590.04 11/4/85 3'-0" 590.04

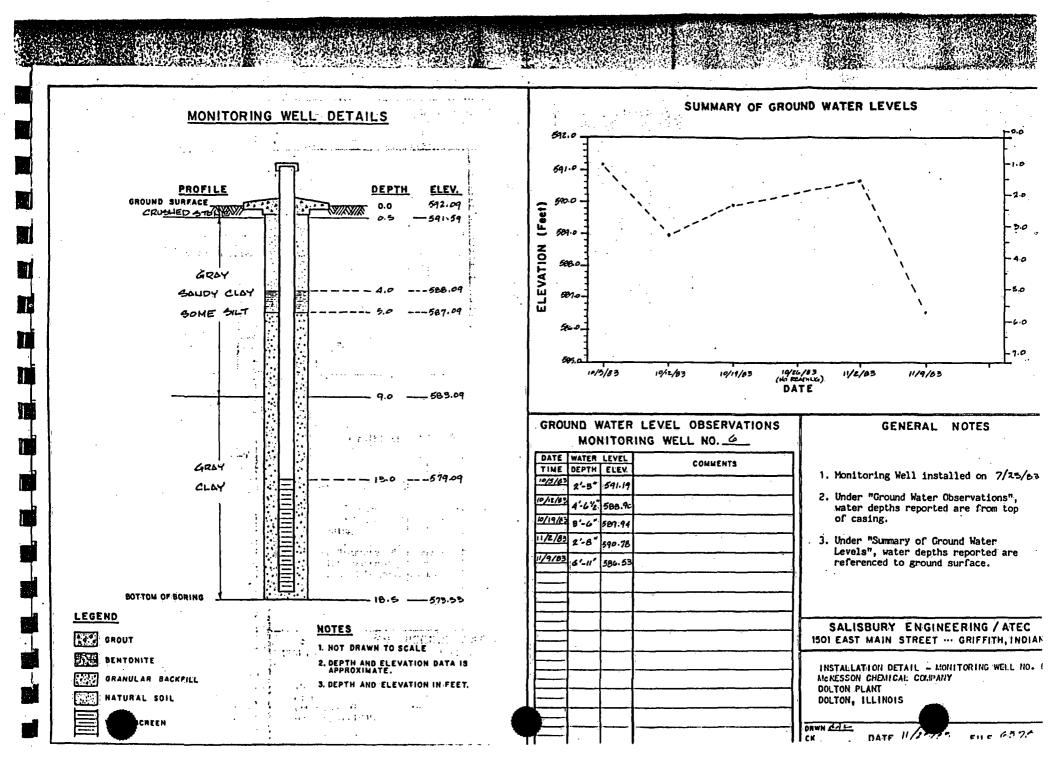
GENERAL NOTES

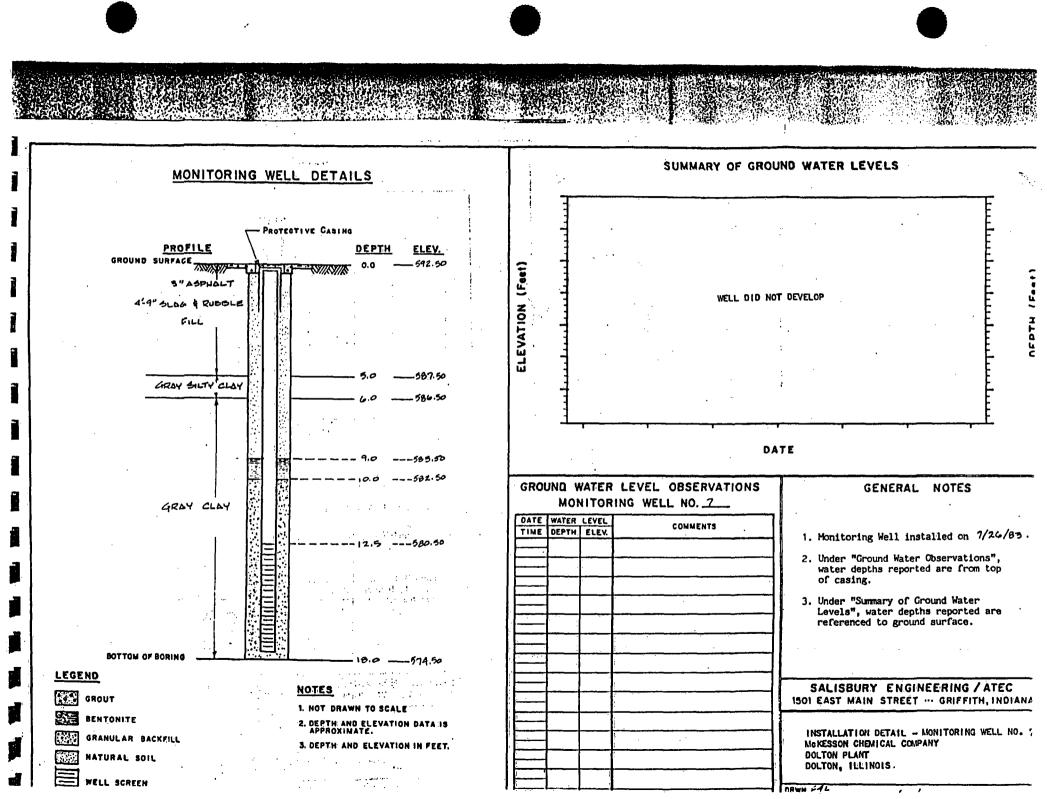
- 1. Monitoring Well installed on 7/23/03.
- Under "Ground Water Observations", water depths reported are from top of casing.
- Under "Summary of Ground Water Levels", water depths reported are referenced to ground surface.

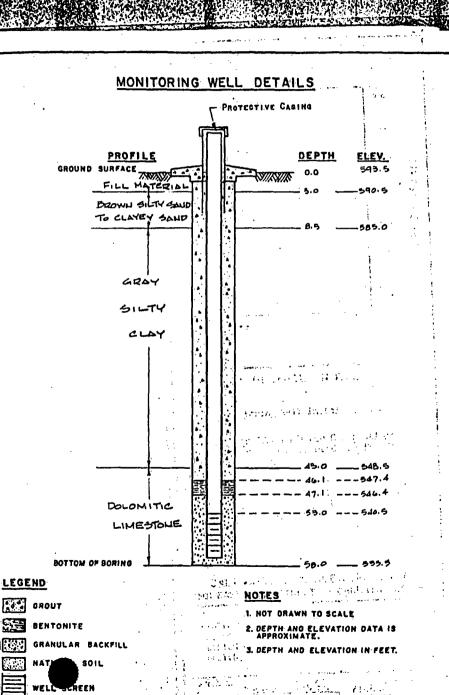
SALISBURY ENGINEERING / ATEC

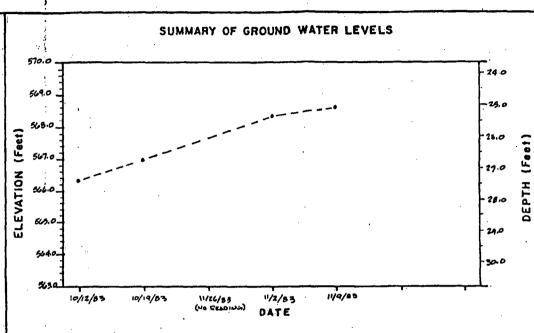
INSTALLATION DETAIL - MONITORING WELL NO. 4
MeKESSON CHEMICAL COMPANY
DOLTON PLANT
DOLTON, ILLINOIS











GROUND WATER LEVEL OBSERVATIONS MONITORING WELL NO. 2

1	DATE	WATER	LEVEL	
ı	TIME	DEPTH	ELEV.	COMMENTS
	10/2/83	25:4"	566.35	
	10/19/83	27.8%	566.96	
	11/2/22	26-44"	569.51	
	11/9/32	26'-2"	568.50	
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GENERAL NOTES

- 1. Monitoring Well installed on 10/6/83.
- Under "Ground Water Observations", water depths reported are from top of casing.
- Under "Summary of Ground Water Levels", water depths reported are referenced to ground surface.

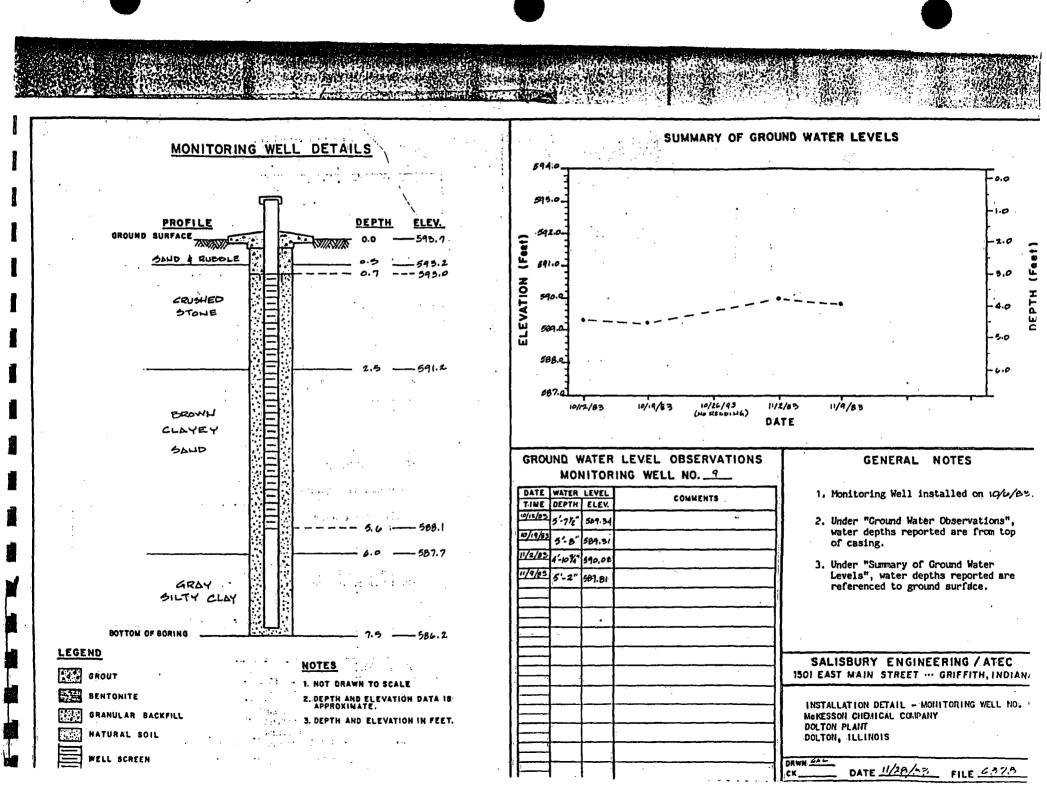
SALISBURY ENGINEERING / ATEC

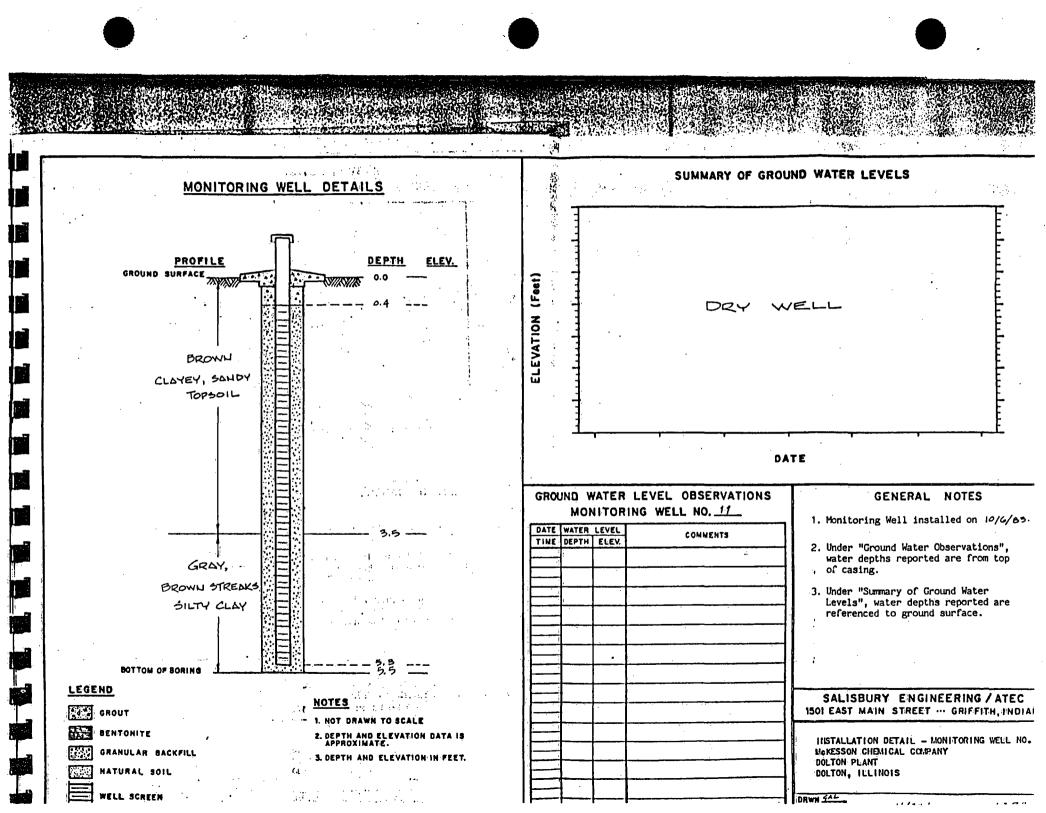
INSTALLATION DETAIL _ MONITORING WELL NO. 8
Mo RESSON CHEMICAL COMPANY
DOLTON PLANT
DOLTON, ILLINOIS

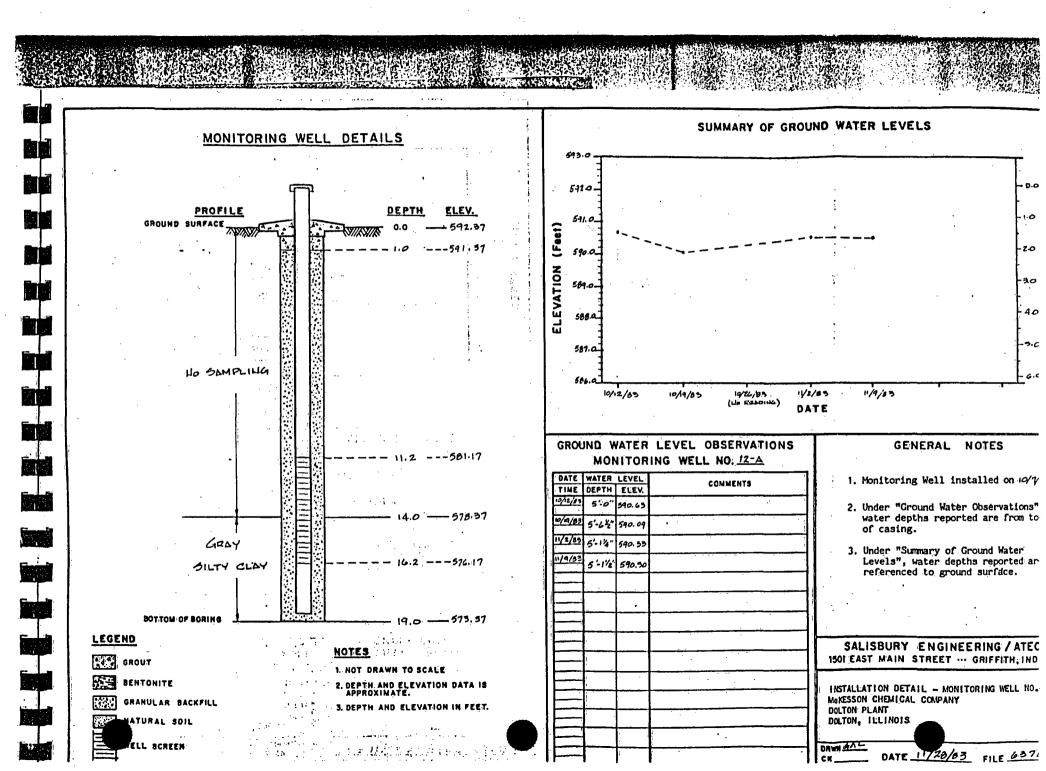
DRWN ALL

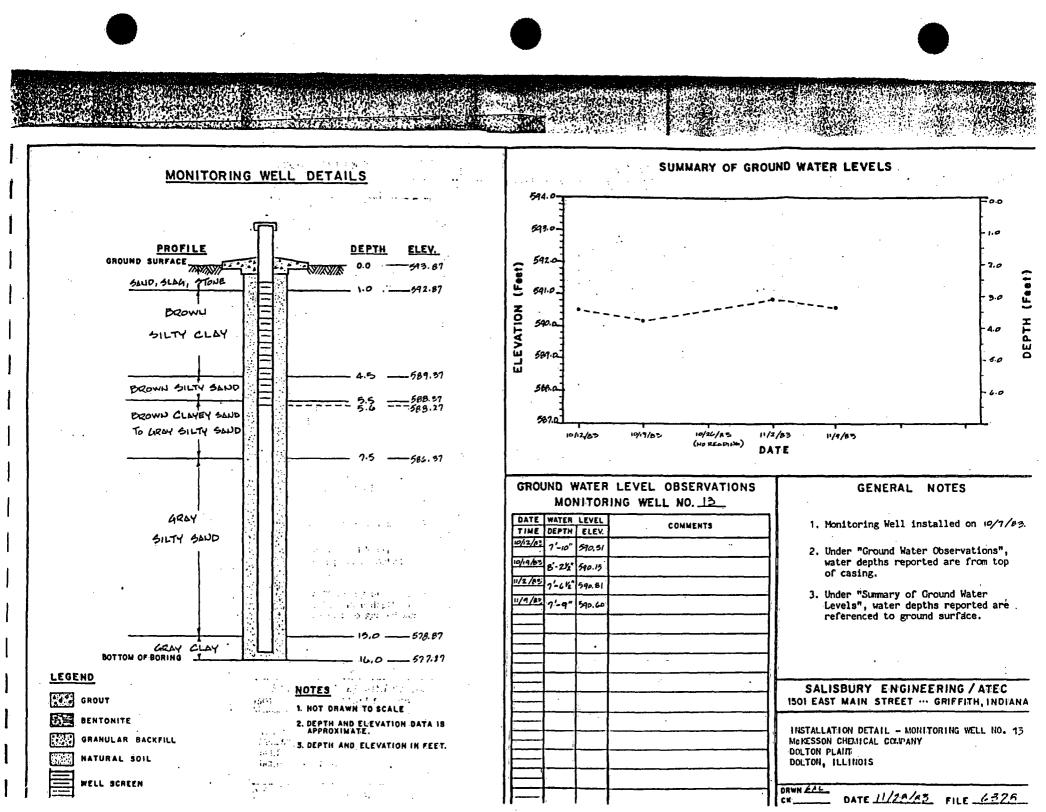
DATE 11/20/5

FILE 6378









MONITORING WELL DETAILS - PROTECTIVE CASING PROFILE DEPTH GROUND SURFACE CRUSHED SLAG & CINDERS DLACK CLAYEY SALID DROWN SAUDY CLAY GRAY CLAYEY SILT (CRGANIC) 4RAY SILTY 3400 GRAY SILTY CLAY BOTTOM OF BORING LEGEND NOTES GROUT 1. NOT DRAWN TO SCALE BENTONITE 2. DEPTH AND ELEVATION DATA IS APPROXIMATE. GRAN<u>ULLA</u> BACKFILL

SUMMARY OF GROUND WATER LEVELS 543.0 672.0 591.0 590.0 ELEVATION 589.0 588.a 387.a 586.0 11/2/83 11/9/83 10/2/05 10/19/65 10/24/03 (NO REPORTED) DATE

GROUND WATER LEVEL OBSERVATIONS MONITORING WELL NO. 14

	WATER		COMMENTS
TIME	DEPTH	ELEY.	COMMENTS
10/12/36	3-11/2	588.47	
10/19.33	B'- 212"	589.57	
11/2/83	2'-7%	570.00	
11/9/83	2'-10/E"	589.74	
			•
	<u> </u>		

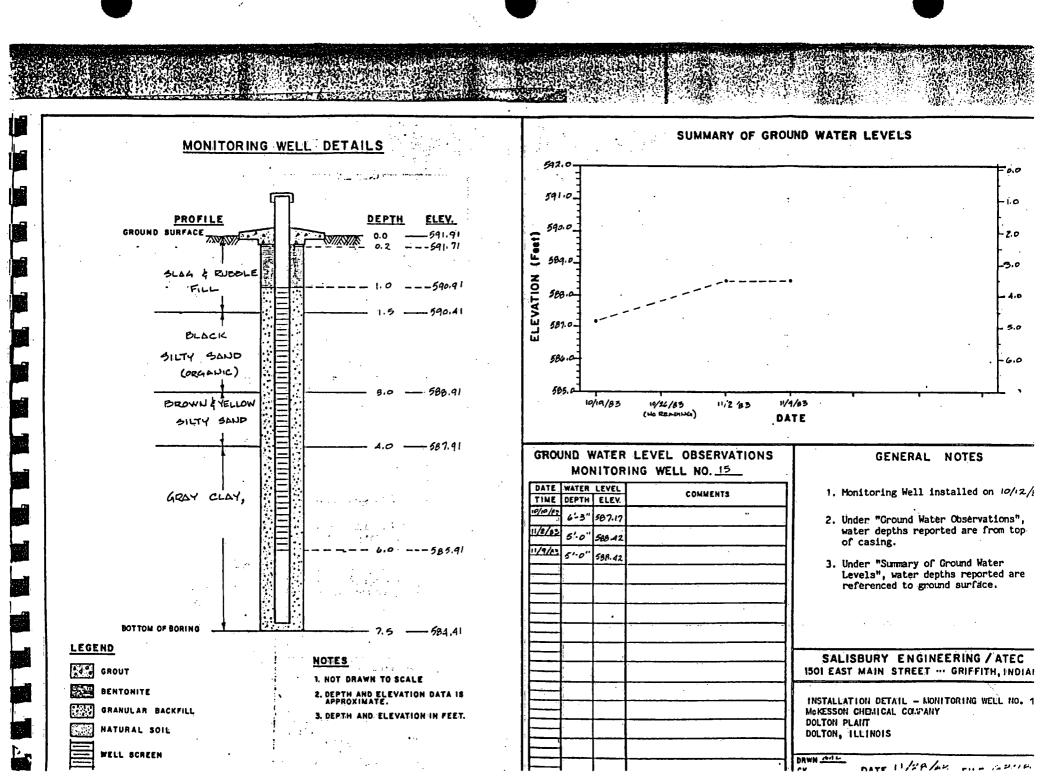
GENERAL NOTES

- 1. Monitoring Well installed on 10/7/63.
- Under "Ground Water Observations", water depths reported are from top of casing.
- Under "Summary of Ground Water Levels", water depths reported are referenced to ground surface.

SALISBURY ENGINEERING / ATEC

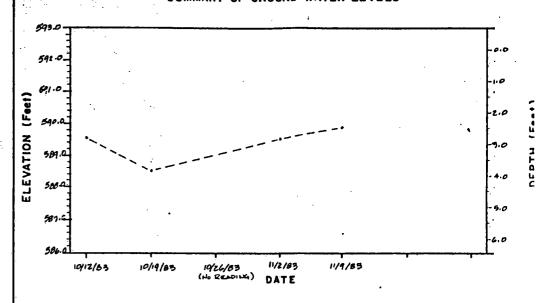
INSTALLATION DETAIL - MOUTTORING WELL NO. 4

S.DEPTH AND ELEVATION IN FEET.



MONITORING WELL DETAILS PROFILE ELEV. GROUND SURFACE 592.39 CRUSHED STOVE RUBBLE GRAY COARSE SAND BLACK SILTY SAUD DROWN TO GRAY & PROWN CLAYEY 31LT BROWN CONSESSION BROWN & GRAY SILTY CLAY SOTTOM OF BORING --535.59 LEGEND GROUT 1. NOT DRAWN TO SCALE BENTONITE 2. DEPTH AND ELEVATION DATA IS APPROXIMATE. GRANULAR BACKFILL 3. DEPTH AND ELEVATION IN FEET. AL SOIL

SUMMARY OF GROUND WATER LEVELS



GROUND WATER LEVEL OBSERVATIONS MONITORING WELL NO. 16.

DATE WATER LEVEL TIME DEPTH ELEV. 0/12/83 5'-0' 589.53 10/19/83 6'-0' 588.52 11/8/83 5'-72" 589.49 11/9/05 4'-8" 589.87

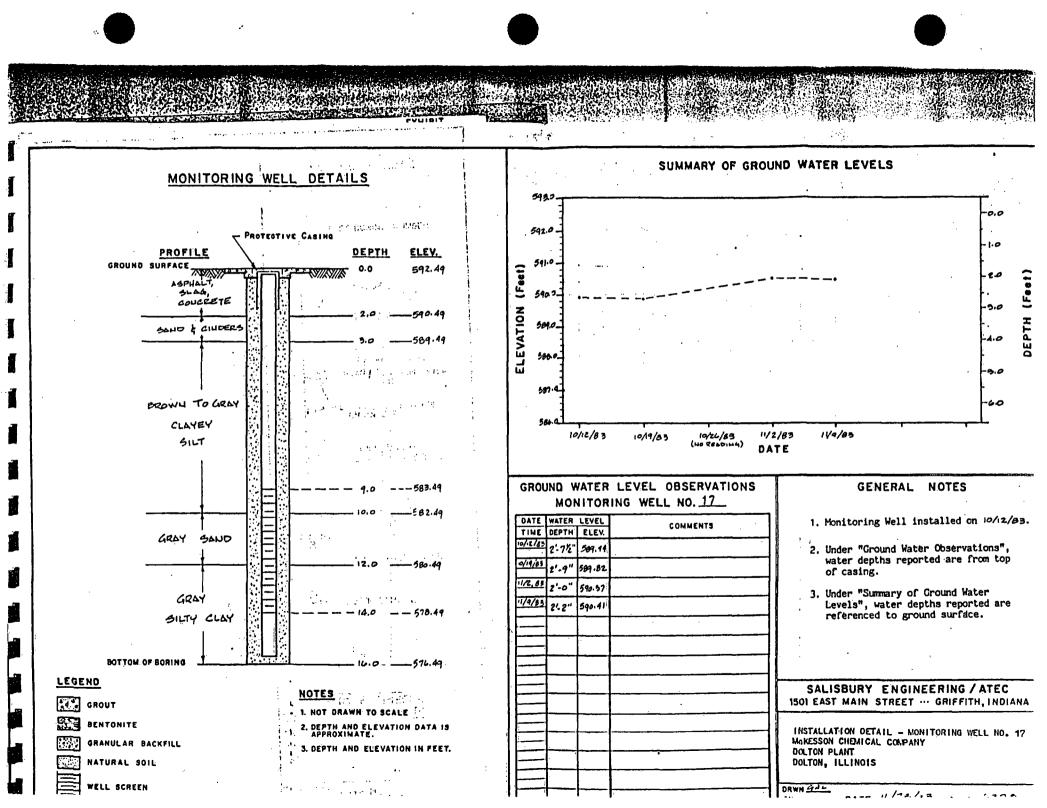
GENERAL NOTES

- 1. Monitoring Well installed on 10/12/88.
- Under "Ground Water Observations", water depths reported are from top of casing.
- Under "Summary of Ground Water Levels", water depths reported are referenced to ground surface.

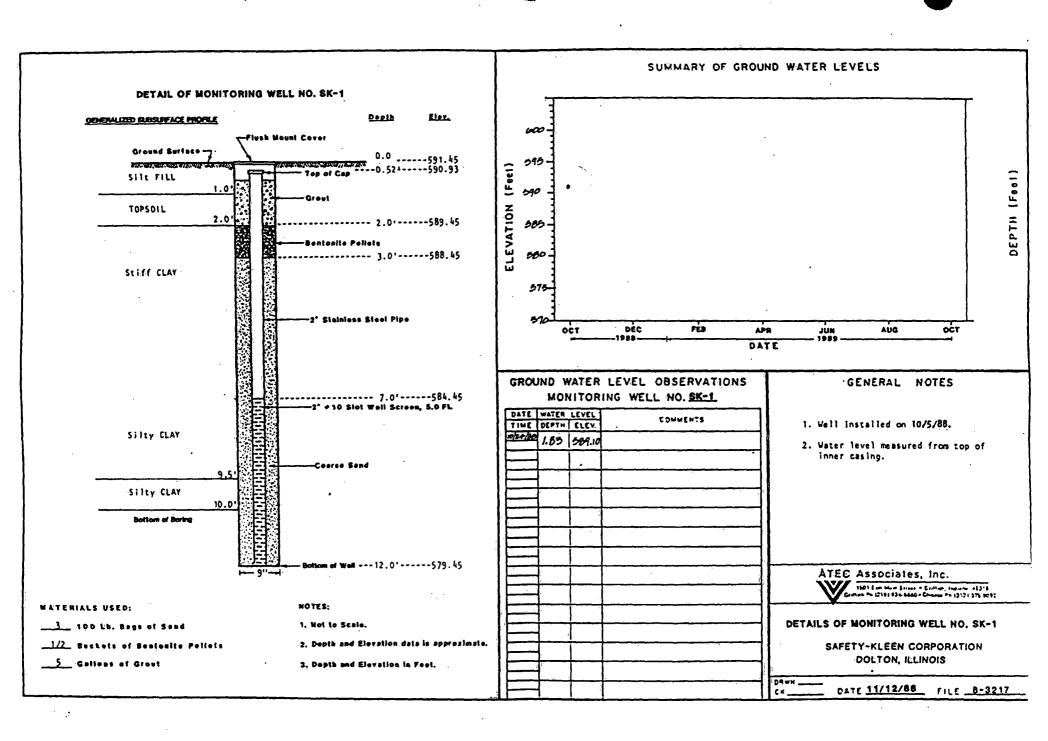
SALISBURY ENGINEERING / ATEC 1501 EAST MAIN STREET ... GRIFFITH, INDIANA

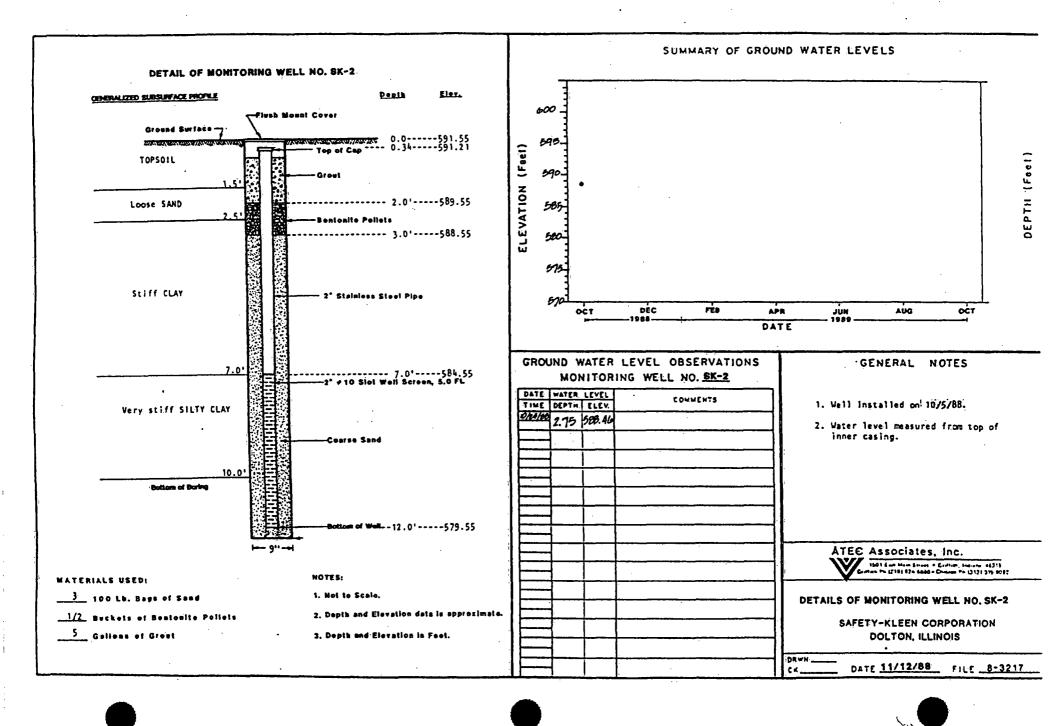
INSTALLATION DETAIL - MONITORING WELL NO. 16
McKESSON CHEMICAL COMPANY
BOLTON PLANT
BOLTON, ILLINOIS

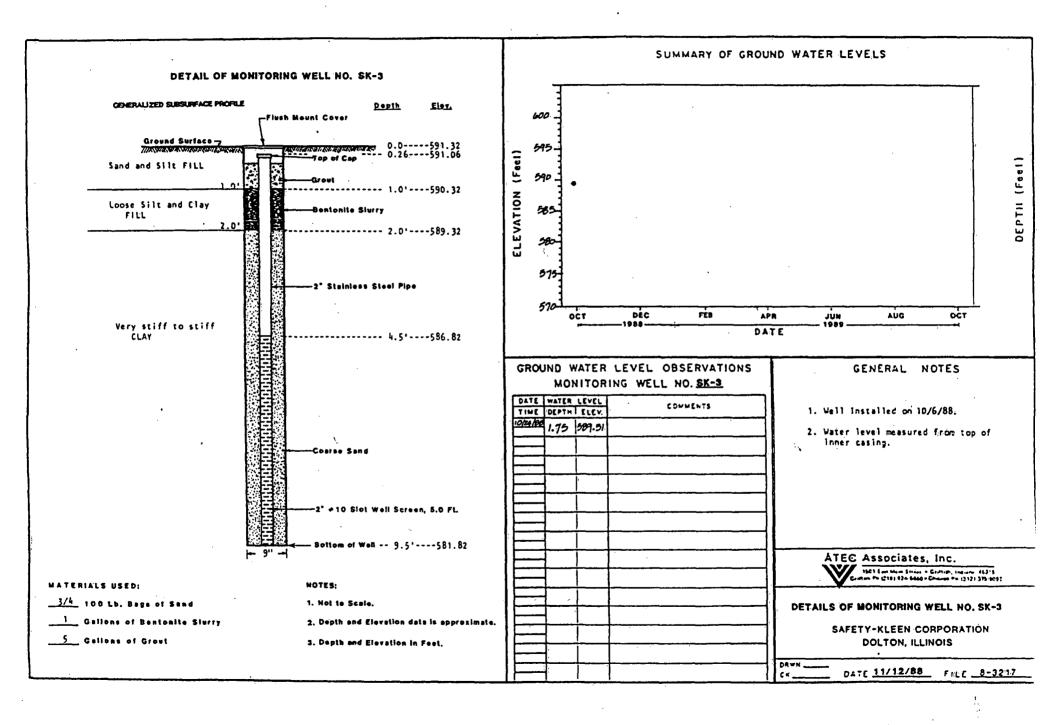
DDWN 62-



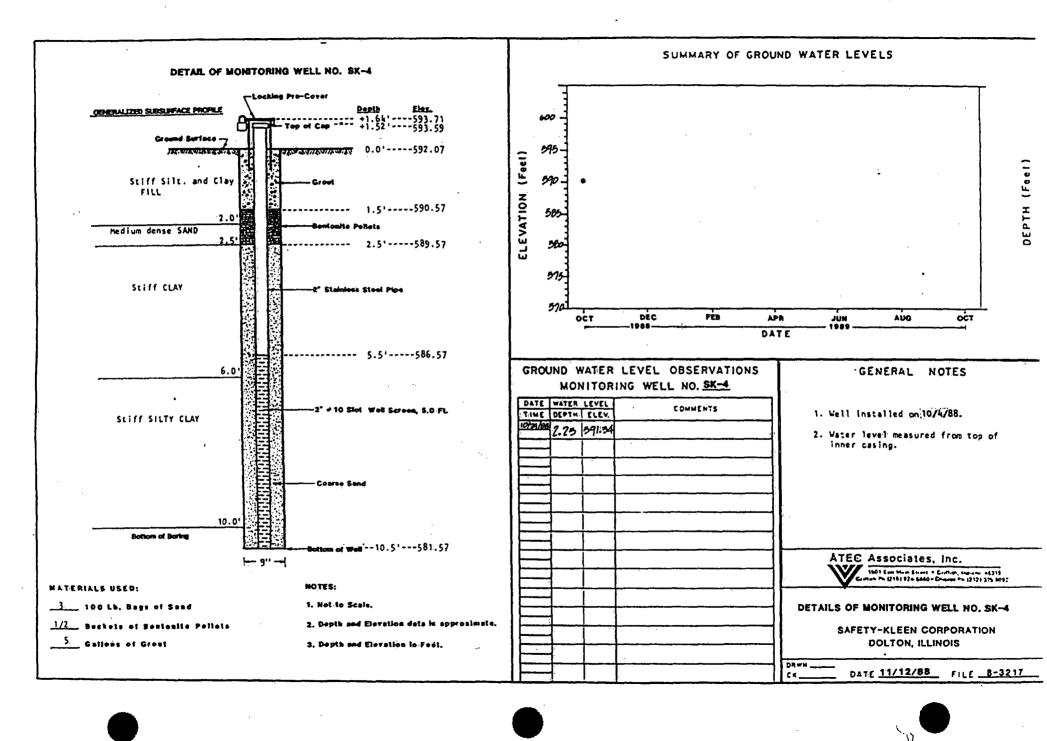
APPENDIX II-E-2
1988 INSTALLATIONS

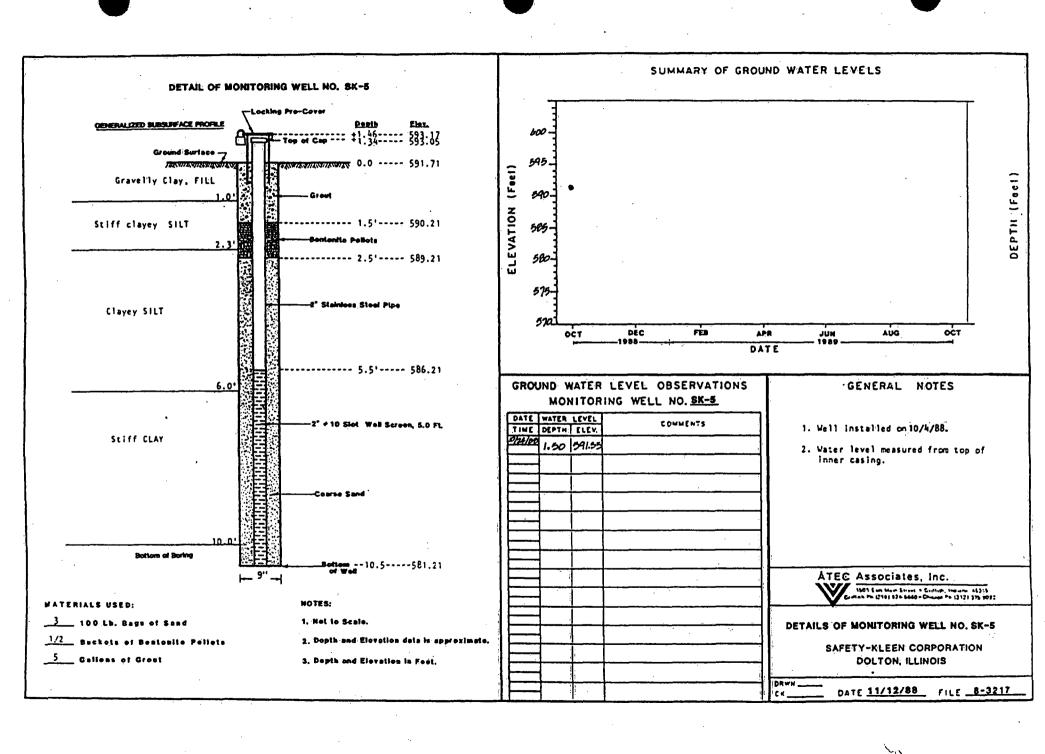


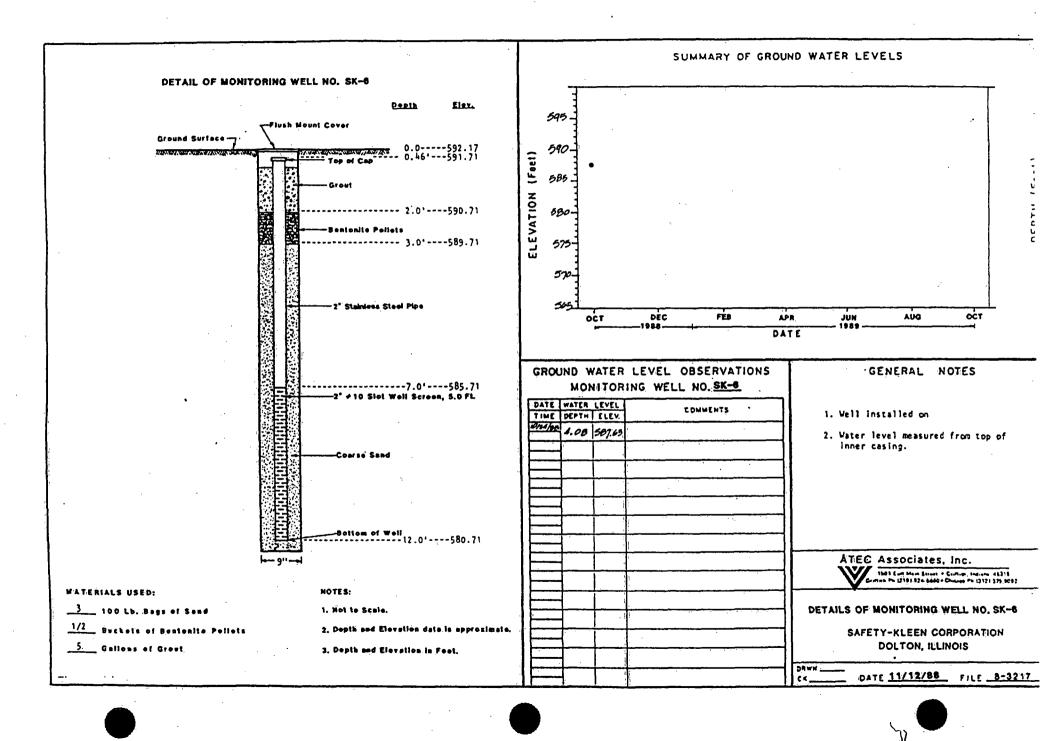


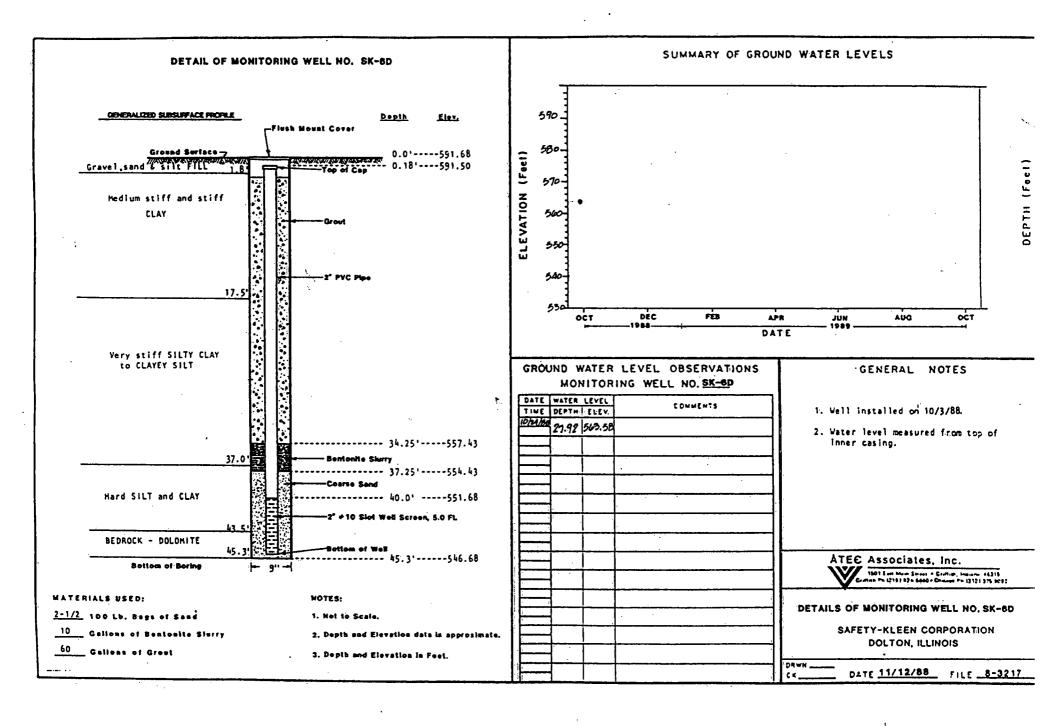


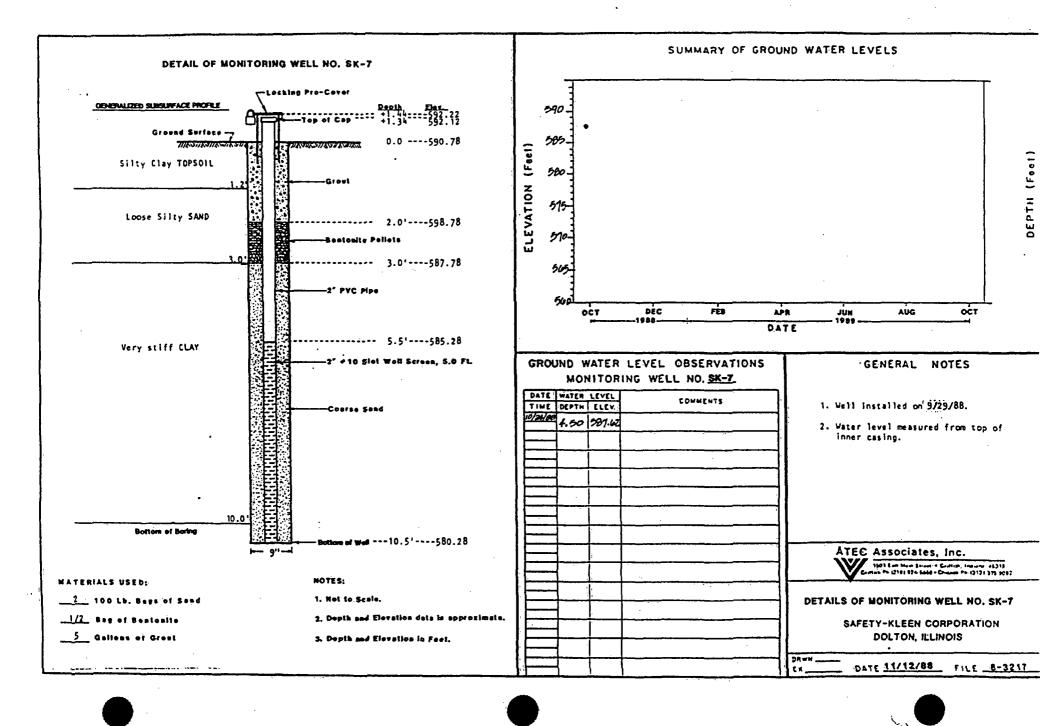
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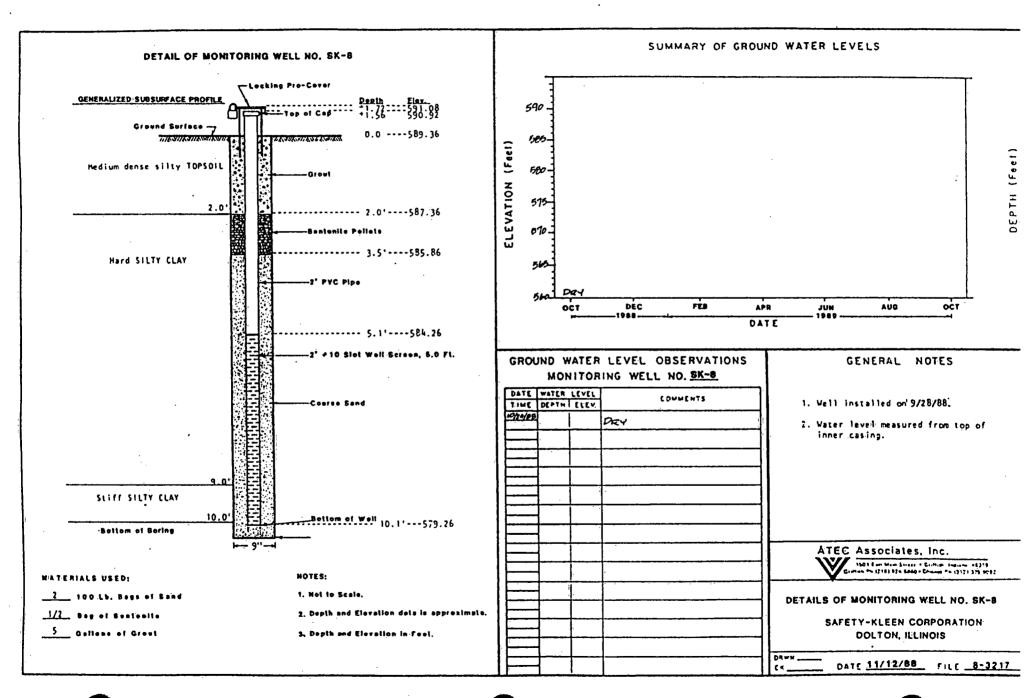




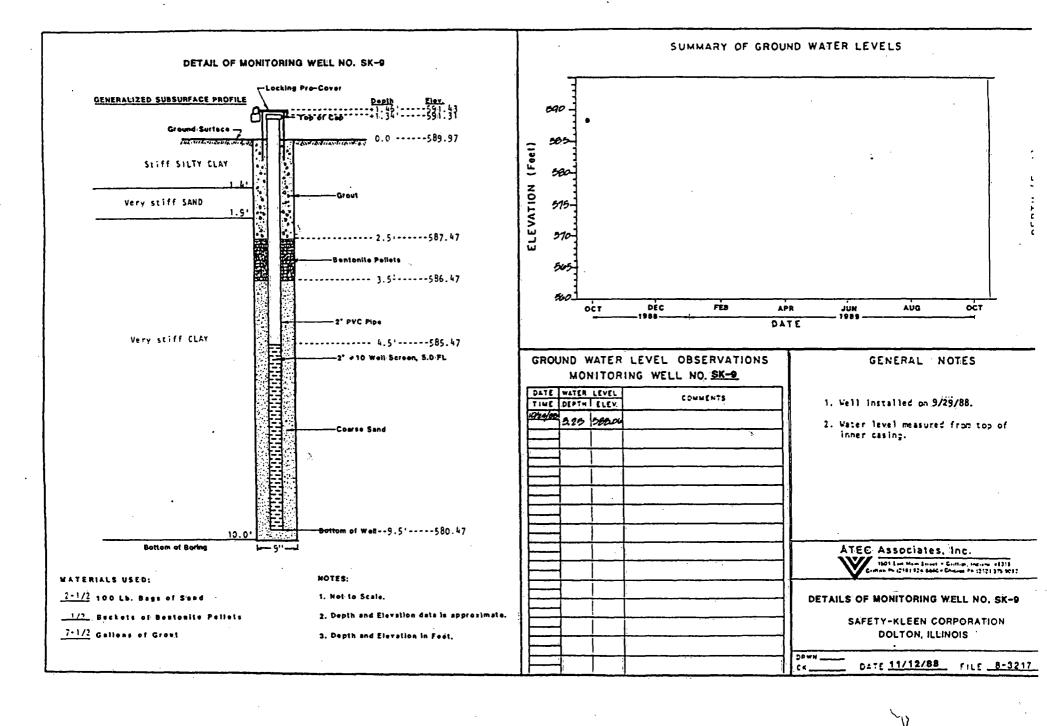


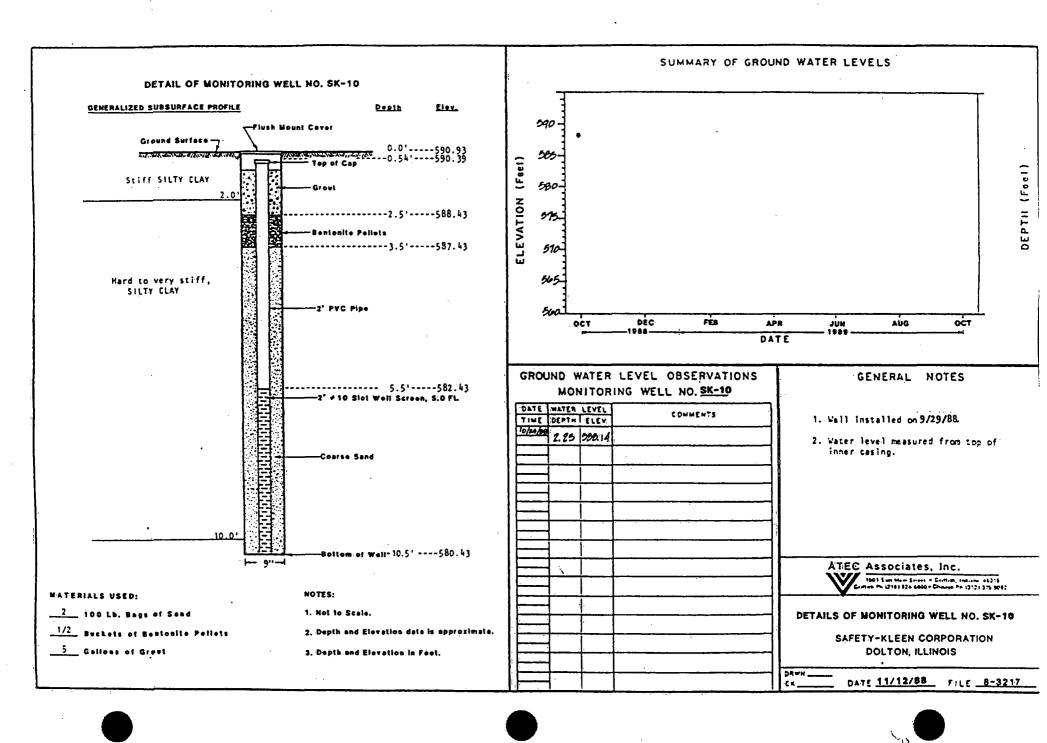


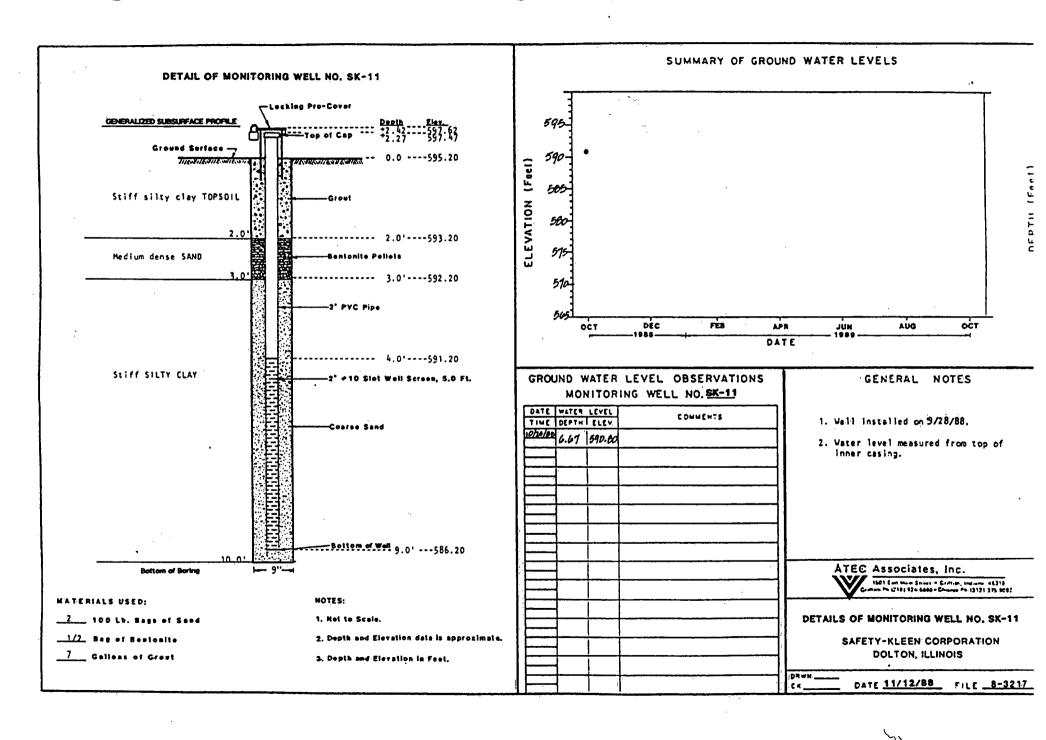
SUMMARY OF GROUND WATER LEVELS DETAIL OF MONITORING WELL NO. SK-7D -Locking Pro-Cover GENERALIZED SUBSUFFACE PROPILE 590. 0.0'----590.66 SILLY TOPSOITHE WIND TO THE 500-(Feel) Loose silty SAND 570-ELEVATION 560 550 Stiff to very stiff CLAY -2' PVC Ploe 23.0 DÉC FEB APR JUN OCT OCT DATE Hard CLAY GROUND WATER LEVEL OBSERVATIONS GENERAL NOTES MONITORING WELL NO. SK-7D DATE WATER LEVEL Dense SAND COMMENTS TIME DEPTH ELEV. 1. Well installed on 9/30/88. -----558.66 24.0 568.15 2. Water level measured from top of 33.0'----557.66 inner casing. Hard SILT -----552.66 -2" + 10 Slot Well Screen, 5.0 FL BEDROCK - DOLOMITE Bottom of Well3.0'--- 547.66 **Bottom of Boring |--- 9"--|** ATEC Associates, Inc. 1501 East Main Street + Contrar, Indiana 46215 Genten Pa (218) 924 6660 + Change Pa (212) 375 9092 WATERIALS USED: NOTES: _______ 100 tb. Bags of Sond 1. Not to Scale. DETAILS OF MONITORING WELL NO. SK-7D 2. Dopth and Elevation data is approximate. Buckets of Bestoplie Pelists SAFETY-KLEEN CORPORATION 90 Gallens of Great 3. Depth and Elevation in Fadt. DOLTON, ILLINOIS DRWN_ DATE 11/12/88 FILE 8-3217











APPENDIX II-F

AQUIFER CHARACTERISTICS DOLTON RECYCLE CENTER

W// 5	1801 East Ma	iates, Inc. on Street • Orlffith, India st. Chicopa, 11, 80810	in - 111:0 (219) 924-66	90/(312) 378-9012	PΕ	RMEAB	ILITY	TEST
	ety-Kie in, Il	een Corpora linois	tico R O J E C	Dolton Dolton,	Kleen Cor Facility Illinois	poration	DATE REPOR SHEET	NO. 8-3217 10/5/88 T NO. 2 1 OF 1 ICIAN WSG
AB NO.		C	G NO	B-7	SAMPLE NO	9	DEPTH _	30.0'
ADING	Q FLOW (ML)	h _O INITIAL HEAD (CM)	h _o - h; DROP IN HEAD (CM)	h; FINAL HEAD (CM)	INITIAL TIME	FINAL TIME	± TIME (SECONDS)	K PERMEABILITY RATE (CM/SEG
1	1	90.0	0.5	89.5	12:35AM 10-5-88	5:07 PM 10-5-88	16,320	4.6x10-8
2	2	90.0	1.4	88.6	ři.	5:25 AM 10-6-88	71,400	2.9x10 ⁻⁸
3	3	90.0	1.6	88.4	11	11:45AM 10-6-88	82,200	2.9×10 ⁻⁸
L _i	3	90.0	1.8	88.2	a t	4:18PM 10-6-88	99,780	2.7x10-8
5	5	90.0	2.9	87.1	61	8:31AM 10-7-88	158,160	2.8×10 ⁻⁸
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·								
							 .	

AREA OF STANDPIPE (CM²) o . 1.661

LENGTH OF SAMPLE (CM) $-1 \approx -2.54$

 $K = \left(\frac{2.3 \text{ a. L}}{\text{At}}\right) \quad \text{LOG} \quad \frac{\text{Ho}}{\text{Hi}} = 2.8 \times 10^{-8} \text{cm/sec}$

AREA OF SAMPLE (CM^2) $\Lambda = 31.65$

 WET DENSITY
 144.9
 PCF

 ORY DENSITY
 121.2
 PCF

 PGISTURE
 19.6
 %

ATEC	Associ	ates.	Inc.
	73300	-	

CLIE

N

ndlana 46319 (219) 924-6690/(312) 378-9092 |-10 (212) 269-1056 D 22 M. Erio St. Chicopa, R. 60610 (212) 264-1056

PERMEABILITY TEST

Safety-Kleen Corporation Elgin, Illinois

0 JECT Safety-Kleen Corporation Dolton Facility Dolton, Illinois

FILE NO. 8-3217 DATE 10/5/88 REPORT NO. SHEET 1 OF TECHNICIAN WSG

SAMPLE NO. Shelby Tube DEPTH 20.0'-22.0' B-6D LAB NO._ P-1 BORING NO.

CLASSIF	I CAT I ON	Gray S	ILTY CLAY					
READING NUMBER	Q FLOW (ML)	h _O INITIAL HEAD (CM)	h _o - h; DROP IN HEAD (CM)	h; FINAL HEAD (CM)	INITIAL TIME	FINAL TIME	± TIME (SECONDS)	K PERMEABILITY RATE (CM/SEC)
1	1	90.0	0.6	89.4	12.35PM 10-5-88	5:07PM 10-5-88	16,320	5.5x10 ⁻⁸
2	4	90.0	2.3	87.7	11	8:25PM 10-6-88	71,400	4.9×10 ⁻⁸
3	4	90.0	2.6	87.4	11	11:48AM 10-6-88	82,200	4.8×10 ⁻⁸
· 4	5	90.0	3.0	87.0	11	4:18PM 10-6-88	99,780	4.6×10 ⁻⁸
5	8	90.0	4.7	85.3	11	8:31AM 10-7-88	158,160	4.6×10 ⁻⁸
				,			· · · · · · · · · · · · · · · · · · ·	
						·		
		·						

AREA OF STANDPIPE (CM^2) a = 1.678

LENGTH OF SAMPLE (CM) 2.54

31.65

 $K = \left(\frac{2.3 \text{ g. L}}{\text{At}}\right)$ LOG $\frac{\text{Ho}}{\text{Hi}}$ =4.6×10⁻⁸ cm/sec

WET DENSITY 132.7 **PCF** 106.0 DRY DENSITY PCF 25.2 MOISTURE ሄ

AREA OF SAMPLE (CM2)

APPENDIX II-G

LABORATORY DATA REPORTS GROUND-WATER QUALITY DOLTON RECYCLE CENTER



November 8, 1988

Solid & Hazardous Waste Site Assessments Remedial Design & Construction **Underground Tank Management** Asbestos Surveys & Analysis Hydrogeologic Investigations & Monitoripg Analytical Testing / Chemistry Industrial Hygiene / Hazard Communication **Environmental Audits & Permitting Exploratory Drilling & Monitoring Wells**

Mr. John McBride ATEC Environmental Services 1501 E. Main Street Griffith, IN 46319

Ten Water VOA: U.S. EPA Method 624

Two Water RCRA Metals

One Water Total Hydrocarbon

SW 846 Method 8015 Revised, 7000 Series

Safety Kleen

ATEC Project Number 52-83217

Dear Mr. McBride:

Enclosed are the results of the Chemical Analyses for the ten water samples which were submitted to the ATEC Environmental/Analytical Testing Division on October 14 1988, on behalf of Safety Kleen. The volatile samples were analyzed on Finnigan Incos 50 and 1020 OWA GC/MS/DS systems, complete with Superincos Software, via U.S. EPA Method 624 for Purgeable Organic Compounds. Prior to analysis the system was tuned against Bromofluorobenzene and calibrated with Total Hydrocarbon analysis was performed the appropriate standard. on a Varian 3700 Gas Chromatograph using Flame Ionization Detection via SW 846 Method 8015 Revised. Metals were analyzed on a Varian SpectrAA-10 Atomic Absorption Spectrophotometer according to the 7000 series of the methods outlined in SW 846.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

Samples will be held for a period of thirty days following the date of this report, after which re-analysis will require the submission of fresh samples. It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted,

ATEC Associates, Inc.

Keith S. Kline

Keich S. Kline

.

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: SK-1

Sample Matrix:

Water

Date Sample Collected: October 12, 1988
Date Sample Received: October 14, 1988
Date Sample Analyzed: October 25, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277A

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
-Chloroethane	75-00-3	200	10
_Methylene Chloride	75-09-2	14	5
Acetone	67-64-1	<10*	10
Carbon Disulfide	75-15-0	< 5	5
_ 1,1-Dichloroethene	75-35-4	6	5
_ 1,1 Dichloroethane	75-35-3	12	5
- Trans-1,2-Dichloroethene	156-60-5	23	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
- 1,1,1-Trichloroethane	71-55-6	38	· 5
Carbon Tetrachloride	56-23-5	< 5	5
- Vinyl Acetate	108-05-4	19	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83277A

	Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
	Trans-1, 3-Dichloropropene	10061-02-6		5
_	Trichloroethene	79-01-6		5
	Dibromochloromethane	124-48-1		5
	1,1,2-Trichloroethane	79-00-5		5
_	Benzene	71-43-2	5	5
	cis-1,3-Dichloropropene	10061-01-5	< 5	5
	2-Chloroethylvinylether	110-75-8	<10	10
	Bromoform	75-25-2	< 5	5
	4-Methyl-2-Pentanone	591-78-6	<10*	io
	2-Hexanone	108-10-1	<10	10
	Tetrachloroethene	127-18-4	59	5
	1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
	Toluene	108-88-3	< 5*	5
	Chlorobenzene	108-90-7	< 5	5
	Ethylbenzene	100-41-4	< 5	5
	Styrene	100-42-5	< 5	5
_	Total Xylenes		12	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: J. Sima Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: SK-

Sample Matrix:

Water

Date Sample Collected: October 12, 1988
Date Sample Received: October 14, 1988
Date Sample Analyzed: October 25, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277B

		oncentration	Quantitation
Analyte	CAS Number	(ug/L)	Limit (ug/L)
Chloromethane	74-87-3	<100	100
Bromomethane	74-83-9	<100	100
Vinyl Chloride	75-01-4	<100	100
Chloroethane	75-00-3	<100	100
Methylene Chloride	75-09-2	180	100
Acetone	67-64-1	15,000	100
Carbon Disulfide	75-15-0	< 50	50
1,1-Dichloroethene	75-35-4	< 50	50
1,1 Dichloroethane	75-35-3	< 50*	50
Trans-1,2-Dichloroethene	156-60-5	< 50*	50
Chloroform	67-66-3	< 50*	50
1,2-Dichloroethane	107-06-2	< 50*	50
2-Butanone	78-93-3	6,800	100
1,1,1-Trichloroethane	71-55-6	< 50.	50
Carbon Tetrachloride	56-23-5	< 50	50
Vinyl Acetate	108-05-4	<100	100
Bromodichloromethane	75-27-4	< 50	50
1,2-Dichloropropane	78-87-5	< 50	50

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83277B

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 50	50
Trichloroethene	79-01-6	53	50
Dibromochloromethane	124-48-1	< 50	50
1,1,2-Trichloroethane	79-00-5	< 50	50
Benzene	71-43-2	55	50
cis-1,3-Dichloropropene	10061-01-5	< 50	50
2-Chloroethylvinylether	110-75-8	<100	100
Bromoform	75-25-2	< 50	50
4-Methyl-2-Pentanone	591-78-6	12,000	100
2-Hexanone	108-10-1	<100*	100
Tetrachloroethene	127-18-4	< 50*	50
1,1,2,2-Tetrachloroethane	79-34-5	< 50	50
Toluené	108-88-3	8,700	50
Chlorobenzene	108-90-7	< 50	50
Ethylbenzene	100-41-4	310	50
Styrene	100-42-5	< 50	50
Total Xylenes		1,800	50

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: J. Sima Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: SK-

Sample Matrix:

Water

Date Sample Collected: October 12, 1988
Date Sample Received: October 14, 1988
Date Sample Analyzed: October 25, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277C

Ama Lista		Concentration	Quantitation
Analyte	CAS Number	(ug/L)	Limit (ug/L)
Chloromethane	74-87-3	<100	100
Bromomethane	74-83-9	<100	100
Vinyl Chloride	75-01-4	<100	100
Chloroethane	75-00-3	<100	100
Methylene Chloride	75-09-2	< 50*	50
Acetone	67-64-1	3,000	100
Carbon Disulfide	75-15-0	< 50	50
1,1-Dichloroethene	75-35-4	< 50	50
1,1 Dichloroethane	75-35-3	< 50	50
Trans-1,2-Dichloroethene	156-60-5	< 50*	50
Chloroform	67-66-3	< 50*	50
1,2-Dichloroethane	107-06-2	< 50	50
2-Butanone	78-93-3	820	100
1,1,1-Trichloroethane	71-55-6	< 50*	50
Carbon Tetrachloride	56-23 <u>-</u> 5	< 50	50
Vinyl Acetate	108-05-4	<100	100
Bromodichloromethane	75-27-4	< 50	50
1,2-Dichloropropane	78-87-5	< 50	50

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83277C

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 50	50
Trichloroethene	79-01-6	58	50°
Dibromochloromethane	124-48-1	< 50	50
1,1,2-Trichloroethane	79-00-5	< 50	50
Benzene	71-43-2	< 50*	50
cis-1,3-Dichloropropene	10061-01-5	< 50	50
2-Chloroethylvinylether	110-75-8	<100	100
Bromoform	75-25-2	< 50	50
4-Methyl-2-Pentanone	591-78-6	370	100
2-Hexanone	108-10-1	<100	100
Tetrachloroethene	127-18-4	< 50*	50
1,1,2,2-Tetrachloroethane	79-34-5	< 50	50
Toluene	108-88-3	320	50
Chlorobenzene	108-90-7	< 50	50
Ethylbenzene	100-41-4	< 50*	50
Styrene	100-42-5	< 50	50
Total Xylenes		54	50

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: J. Sima Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

Keith S. Kline
Environmental/Analytical Testing Division

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: SK-4

Sample Matrix:

Water

Date Sample Collected: October 12, 1988
Date Sample Received: October 14, 1988
Date Sample Analyzed: October 25, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277D

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	1,600	5
Acetone	67-64-1	15,000	10
Carbon Disulfide	75-15-0	< 5	5
l,1-Dichloroethene	75-35-4	< 5	5
1,1 Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5*	5
Chloroform	67-66-3	< 5*	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	1,400	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56 - 23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83277D

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	20	5
cis-1,3-Dichloropropene	10061-01-5	< 5	- 5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591-78-6	1,800	10
2-Hexanone	108-10-1	18	10
Tetrachloroethene	127-18-4	< 5	. 5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	770	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5*	5
Styrene	100-42-5	< 5	5
Total Xylenes		810	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: J. Sima Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification:

Sample Matrix:

Water October 12, 1988

Date Sample Collected: Date Sample Collection
Date Sample Received:

Date Sample Analyzed:

October 14, 1988 October 26, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277E

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<5,000	5,000
Bromomethane	74-83-9	<5,000	5,000
Vinyl Chloride	75-01-4	<5,000	5,000
Chloroethane	75-00-3	<5,000	5,000
Methylene Chloride	75-09-2	<2,500	2,500
Acetone	67-64-1	130,000	5,000
Carbon Disulfide	75-15-0	<2,500	2,500
1,1-Dichloroethene	75-35-4	<2,500	2,500
1,1 Dichloroethane	75-35-3	<2,500	2,500
Trans-1,2-Dichloroethene	156-60-5	<2,500	2,500
Chloroform	67-66-3	<2,500*	2,500
1,2-Dichloroethane	107-06-2	<2,500	2,500
2-Butanone	78-93-3	11,000	5,000
1,1,1-Trichloroethane	71-55-6	<2,500	2,500
Carbon Tetrachloride	56-23-5	<2,500	2,500
Vinyl Acetate	108-05-4	<5,000	5,000
Bromodichloromethane	75-27-4	<2,500	2,500
1,2-Dichloropropane	78-87-5	<2,500	2,500

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83277E

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	<2,500	2,500
Trichloroethene	79-01-6	<2,500	2,500
Dibromochloromethane	124-48-1	<2,500	2,500
1,1,2-Trichloroethane	79-00-5	<2,500	2,500
Benzene	71-43-2	<2,500	2,500
cis-1,3-Dichloropropene	10061-01-5	<2,500	2,500
2-Chloroethylvinylether	110-75-8	<5,000	5,000
Bromoform	75-25-2	<2,500	2,500
4-Methyl-2-Pentanone	591-78-6	64,000	5,000
2-Hexanone	108-10-1	<5,000	5,000
Tetrachloroethene	127-18-4	<2,500	2,500
1,1,2,2-Tetrachloroethane	79-34-5	<2,500	2,500
Toluene	108-88-3	230,000	2,500
Chlorobenzene	108-90-7	<2,500	2,500
Ethylbenzene	100-41-4	<2,500*	2,500
Styrene	100-42-5	<2,500	2,500
Total Xylenes		7,300	2,500

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: SK-6

Sample Matrix:

Water

Date Sample Collected: Date Sample Received: October 12, 1988

October 14, 1988 November 2, 1988 Date Sample Analyzed:

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277F

			•	
Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)	
Chloromethane	74-87-3	<10	10	
Bromomethane	74-83-9	<10	10	
Vinyl Chloride	75-01-4	<10	10	
Chloroethane	75-00-3	<10	10	
Methylene Chloride	75-09-2	< 5	5	
Acetone	67-64-1	<10*	10	
Carbon Disulfide	75-15-0	< 5	5	
1,1-Dichloroethene	75-35-4	< 5	5	
1,1 Dichloroethane	75-35-3	< 5	5	
Trans-1,2-Dichloroethene	156-60-5	< 5	5	
Chloroform	67-66-3	< 5*	5	
1,2-Dichloroethane	107-06-2	< 5	5	
2-Butanone	78-93-3	<10	10	
1,1,1-Trichloroethane	71-55-6	< 5	. 5	
Carbon Tetrachloride	56-23-5	< 5	5	
Vinyl Acetate	108-05-4	<10	10	
Bromodichloromethane	75-27-4	< 5	5	
1,2-Dichloropropane	78-87-5	< 5	5 .	

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83277F

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6		5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591-78-6	<10	10
2-Hexanone	108-10-1	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 8, 1988

Respectfully submitted,

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification:

Sample Matrix:

Water

Date Sample Collected: October 12, 1988
Date Sample Received: October 14, 1988
Date Sample Analyzed: October 26, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

SK-6D

ATEC Lab No. 83277G

Analyte	CAS Number	oncentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5	5
Acetone	67-64-1	<10*	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1 Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5*	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	< 5	. 5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83277G

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591-78-6	<10	10
2-Hexanoné	108-10-1	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5*	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification:

Sample Matrix:

Water

Date Sample Collected: Date Sample Received: October 14, 1988

October 12, 1988

SK-7D

Date Sample Analyzed: October 26, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277H

Analyte	CAS Number	oncentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5	5
Acetone	67-64-1	<10*	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1 Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	. 10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	1,0
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83277H

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6		5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	. 5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	Š
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591 - 78-6	<10	10
2-Hexanone	108-10-1	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5*	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: 8-D

Sample Matrix:

Water

Date Sample Collected:
Date Sample Received:
Date Sample Analyzed:

October 12, 1988 October 14, 1988

October 14, 1988 October 27, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277I

Analyte	CAS Number	oncentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<50	50
Bromomethane	74-83-9	<50	50
Vinyl Chloride	75-01-4	<50	50
Chloroethane	75-00-3	<50	50
Methylene Chloride	75-09-2	<25	25
Acetone	67-64-1	<50*	50
Carbon Disulfide	75-15-0	<25	25
1,1-Dichloroethene	75-35-4	<25	25
1,1 Dichloroethane	75-35-3	<25	25
Trans-1,2-Dichloroethene	156-60-5	<25	25
Chloroform	67-66-3	<25	25
1,2-Dichloroethane	107-06-2	<25	25
2-Butanone	78-93-3	<50*	50
1,1,1-Trichloroethane	71-55-6	<25	25
Carbon Tetrachloride	56-23-5	<25	25
Vinyl Acetate	108-05-4	<50	50
Bromodichloromethane	75-27-4	<25	25
1,2-Dichloropropane	78-87-5	<25	25

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83277I

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	<25	25
Trichloroethene	79-01-6	<25	25
Dibromochloromethane	124-48-1	<25	25
1,1,2-Trichloroethane	79-00-5	<25	25
Benzene	71-43-2	<25	25
cis-1,3-Dichloropropene	10061-01-5	<25	25
2-Chloroethylvinylether	110-75-8	<50	50
Bromoform	75-25-2	<25	25
4-Methyl-2-Pentanone	591-78-6	<50	50
2-Hexanone	108-10-1	<50	50
Tetrachloroethene	127-18-4	<25	25
1,1,2,2-Tetrachloroethane	79-34-5	<25	25
Toluene	108-88-3	<25	25
Chlorobenzene	108-90-7	<25	25
Ethylbenzene	100-41-4	<25	25
Styrene	. 100-42-5	<25	25
Total Xylenes		<25	25

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 8, 1988

Respectfully submitted,

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: SK-9

Sample Matrix:

Water

Date Sample Collected: October 12, 1988 Date Sample Received: October 14, 1988
Date Sample Analyzed: October 28, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277J

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5	5
Acetone	67-64-1	<10*	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1 Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5*	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83277J

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591-78-6	<10	10
2-Hexanone	108-10-1	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	- 5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 8, 1988

Respectfully submitted,

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: SK-10

Sample Matrix:

Water

Date Sample Collected: October 12, 1988
Date Sample Received: October 14, 1988

Date Sample Analyzed:

October 28, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277K

		oncentration	
Analyte	CAS Number	(ug/L)	Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1 Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5*	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	< 5*	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	. 5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83277K

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591 - 78-6	<10	10
2-Hexanone	108-10-1	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 8, 1988

Respectfully submitted,

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification:

Sample Blank

Sample Matrix:

Water

Date Sample Collected:

October 12, 1988

Date Sample Received: October 14, 1988
Date Sample Analyzed: November 2, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277L

lance lands		oncentration	Quantitation
Analyte	CAS Number	(ug/L)	Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5*	5
Acetone	67-64-1	27	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1 Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5*	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< .5	5
1,2-Dichloropropane	78-87-5	· < 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83277L

	•	Concentration	Quantitation
Analyte	CAS Number	(ug/L)	Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591-78-6	<10	10
2-Hexanone	108-10-1	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5*	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5*	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5*	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 8, 1988

Respectfully submitted,

REPORT OF TEST RESULTS

ATEC Project Number 52-83217

DATE:

November 8, 1988

CLIENT:

ATEC Environmental Services

1501 E. Main Street Griffith, IN 46319

SAMPLE IDENTIFICATION:

Safety Kleen

Total Hydrocarbon Analysis SW 846 Method 8015 Revised

SAMPLE TAKEN BY:

ATEC (AR)

SAMPLE MATRIX:

Water

DATE SAMPLED:

October 12, 1988

DATE RECEIVED:

October 14, 1988

DATE ANALYZED:

October 26, 1988

ANALYST:

RAR

* Hydrocarbon detected below Quantitation Limit

Sample Identification	Total <u>Hydrocarbon</u>	Quantitation Limit
SK-3	<10 ppb*	10 ppb

Respectfully submitted, ATEC Associates, Inc.

REPORT OF TEST RESULTS

ATEC Project Number 52-83217

ATE:

November 8, 1988

CLIENT:

ATEC Environmental Services

1501 E. Main Street Griffith, IN 46319

SAMPLE IDENTIFICATION:

Safety Kleen

AMPLE MATRIX:

Water

AMPLE TAKEN BY:

ATEC (AR)

DATE SAMPLE TAKEN:

October 12, 1988

DATE RECEIVED:

October 14, 1988

NALYST:

KEB, AJB

'arameter [units in mg/l unless noted) al Metals	Sample	Sample I.D. Number		SW 846
	_SK-1	_SK-2_	MDL*	Analytical Method No.
Arsenic	< 0.05	< 0.05	0.05	7061
Barium	< 0.5	< 0.5	0.5	7080
Cadmium	< 0.01	0.01	0.01	7130
hromium	< 0.05	< 0.05	0.05	7190
Lead	< 0.05	< 0.05	0.05	7420
lercury	<0.002	<0.002	0.002	7470
selenium	< 0.01	< 0.01	0.01	7741
Tilver	< 0.05	< 0.05	0.05	7760

* Method Detection Limit

Respectfully submitted, ATEC Associates, Inc.

Keirk 5-Kline
Environmental/Analytical Testing Division

883271

CHAIN OF CUSTODY RECORD

PROJ. I	NO.	PROJEC	TNA	ME			OF CUS	<u> </u>			7	7	, 	7 7 7		
8-32					Kleen		NO.					\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\				
SAMPLER				У	74.001	 	1			/ ,	/ ¿	1	/ /	/:		
	dren		ev	R		•	OF	ł			5/-					REMARKS
STA, NO.	DATE	TIME	COMP.	GRAB	STATIO	N LOCATION	TAINERS	/.	/2 /\	0/2					•	
9K-1	lo/iziM	2:15			· · · · · · · · · · · · · · · · · · ·		2 ×	×	×							:
Sk-2	11	3:50					2 \$	×	×							
5k·3	11	4:00				·	2 ×	Y		×						
SK - 4	: 41	3:00					1 4	×								
514.5	41	3:15				i i	1 ×	×								
SK-6		3:40					1 4	×								;
5k-60	11	3:30					1 4	×								
Sk-70	"	1:30					1 ×	×						71		
5k-9	"	4:15				-	1 8	×								
SK-10	ų	4:05					1 4	×								
8-D	11	2:55					1. ~	Y								
blank	,,	3:41) ×	K_								
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Relinquish					Date / Time	Received by: (Signature		Reli	nquis	hed b	y: /Sig	natur	•1	Date	/Time	Received by: (Signature)
Relinquist	ned by: /	Signatura	· /		Date / Time	Received for Laborator (Signature)	• • •	101	•	e / Ti	me ;15 _A .		emark			
						V						1				

Facility Name		•		Sample Po		, _	
Purge Date:	113/28			Casing Vol			
Purge Time:	2:00 PM		•	Vol. Purged	t (gals.)ដ	2.00	m ·
Sample Date: 10	112/88			Sample	Method:	<u>Ee+16</u>	on bai
Sample Time:						<u> </u>	·
-			 	Total We		12.	15
Elevation:	001						
Water Level:	2.8'					_	
GW Elevation:			S	ample Terr	p. (°C) <u>-</u>		
	<u> </u>		56	0.0			
Weather Conditions:	Jung	Windy _	<u> </u>	· · ·		·	
Sample Appearance:Sampler Comments:	(loudy)	black,	Stoca	s hyde	er Care	scc_Cs	<u>or</u>
Sampier Comments:	well	recharge	<u>/ 3 </u>	culy,	The	coce	<u> </u>
	1x56 C	Lon 3 w	well	welson	<u> </u>	Pince.	<u>ed</u> .
							
				.			
eable To Obtain Sample (X)	:Reason:						
nable To Obtain Sample (X)							
mple Composited (X):							
mple Composited (X):							
mple Composited (X):							
pH							
pH Sp. Cond (umhos)	Procedu	ure/Proportions	5:				
pH	Procedu		5:				
pH Sp. Cond (umhos)	Procedu	ure/Proportions	5:				
pH Sp. Cond (umhos)	Procedu	ure/Proportions	5:				
pH Sp. Cond (umhos)	Procedu	ure/Proportions	5:				
pH Sp. Cond (umhos)	Procedu	ure/Proportions	5:				
pH Sp. Cond (umhos)	Procedu	ure/Proportions	5:				
pH Sp. Cond (umhos) Lab Comments:	Procedu	ere/Proportions	s:	12.15 = 5	2.8)	1 O	
pH Sp. Cond (umhos)	Ca six	accordance with	n EPA an	12. 15 = 5sc	e protoce	ois.	

Facility Name Safety - Heen, Dal	Gen, IL Sample Point By SK-2
Purge Date: 10 / 17 / 88	Casing Vol. (gals.): /,3D
Purge Time: 34.1	Vol. Purged (gals.): 2,0
Sample Date: 10/12/88	Sample Method Ceflon baile
Sample Time: 350	
Sample Time	
Elevation:	Total Well Depth: 12.2
Water Level: 4.3	Stick-Up:
GW Elevation	Sample Temp. (° C):
Weather Conditions: Scary	SO F
weather Conditions: Ch	lark br., streng solvent odor
Sample Appearance: (164 17)	lace the
	uols removed
	1013. removed
Jnable To Obtain Sample (X):Reason:	
Sample Composited (X): Procedure/Prop	portions:
 	
рН	
p	
Sp. Cond	
(umhos)	
Lab Comments: 4. 0.163 =	CAS VOI.
(17.2-4.3).0163 =	
[77	7. 5.0
···········	· · · · · · · · · · · · · · · · · · ·
_	
certify that sampling procedures were in accorda	nce with EPA and corporate protocols.
Sampler Name (print) _ ANCINE D 12 00 14	
and the state of t	

Facility Name Safety - then, A	Pollen, The Sample Point I.D. 5K-3	
Purge Date 10/12/88	Casing Vol. (gals.):/. / 8	
Purge Time 3250	Vol. Purged (gals.): 3,54	
Sample Date: 10/ 12/88	Sample Method: Lefton	baile
Sample Time: 4:00	<u> </u>	
Elevation:	Total Well Depth 9.45	
Water Level: 2-2		
GW Elevation	Sample Temp. (° C):	
GVV Elevation	Sample remp. (_O,	
Weather Conditions Sana	y / wordy, 50°F	·
Sample Appearance: Cloudy	, moderate solvent oder	
Sampler Comments modern	le recharge	_
·		_
		_
		-
anhia Ta Ohiaia Samala (Y): Rasson:		•
		-
	Proportions:	· -
		- - -
		· ·
		· ·
emple Composited (X): Procedure/P		- -
pH		-
pH		-
pH		-
pHSp. Cond(umhos)	Proportions:	-
pHSp. Cond(umhos)	Vol= (945 - 2.2) x 0./63	-
pHSp. Cond(umhos)	Proportions:	
pHSp. Cond(umhos)	Vol= (945 - 2.2) x 0./63	-
pHSp. Cond(umhos)	Vol= (945 - 2.2) x 0./63	
pHSp. Cond(umhos)	Vol= (945 - 2.2) x 0./63	
pHSp. Cond(umhos)	Vol= (945 - 2.2) x 0./63	
pH	Proportions: $Vol = (945 - 2.2) \times 0.163$ $Vol = 1.18 \text{ Sals}$	
pH	Proportions: $(945 - 2.2) \times 0.163$ $= 1.18 \text{ sa/s}$ rdance with EPA and corporate protocols.	- - - -
pHSp. CondSp. Cond	Proportions: $(945 - 2.2) \times 0.163$ $= 1.18 \text{ sa/s}$ rdance with EPA and corporate protocols.	- -

Facility Name Safety - Klee	n Dalen , TZ Sample Point I.D. SK-4
Purge Date: 10/12/8	
Purge Time: 2:50	Vol. Purged (gals.): 15 gal
Sample Date: 10/11/82	
Sample Time: 3.00	
Elevation	Total Well Depth: 12.1
Water Level: 2.9	Stick-Up
GW Elevation:	Sample Temp. (° C)
	anay, windy, Soot
	andy, dark brown to ed, strong
Sampler Comments:	solvent ador
	edure/Proportions:
рН	
pn	
Sp. Cond (umhos)	
Lab Comments Caso	ing vol = (12.1-2.9) × 0.163
I certify that sampling procedures were in	n accordance with EPA and corporate protocols.
Sampler Name (print) ANDRED 2	eeve signature Chelica Lecue

Purge Date:/_		Casing Vol. (gals.):
Purge Time:		Vol. Purged (gals.): 4.7 Ful
Sample Date:		Sample Method: Lefton ba
Sample Time:	3.15	
Elevation:		Total Well Depth: 12,15
Water Level	2.47'	Stick-Up:
GW Elevation:		Sample Temp. (° C):
Weather Conditions:	Sanay	windy, 450F
Sample Appearance:	Cloudy	black- beaus, " eny stoon
Sampler Comments:	che	need oder
• . —————	<u> </u>	
able To Obtain Sample (X):Reason:	
		/Proportions:
		/Proportions:
mple Composited (X):		
mple Composited (X):	Procedure	
pH Sp. Cond	Procedure	
mple Composited (X):	Procedure	
pH Sp. Cond	Procedure	
pH Sp. Cond (umhos)	Procedure	/Proportions:
pH Sp. Cond (umhos)	Procedure	Proportions: 3 = cas vol.
pH Sp. Cond (umhos)	Procedure	$\frac{3}{3} = \cos \sqrt{3}.$ = (12.15 - 2.42) x 0.163
pH Sp. Cond (umhos)	Procedure	$\frac{3}{3} = \cos \sqrt{3}.$ = (12.15 - 2.42) x 0.163
pH Sp. Cond (umhos)	Procedure	$\frac{3}{3} = \cos \sqrt{3}.$ = (12.15 - 2.42) x 0.163
pH Sp. Cond (umhos) Lab Comments:	h. 0.16	Proportions: $3 = cas vol.$ $= (12.15 - 2.42) \times 0.163$ $= 1.58$
pH Sp. Cond (umhos) Lab Comments:	h i 0.16	$\frac{3}{3} = \cos \sqrt{3}.$ = (12.15 - 2.42) x 0.163

Purge Date: 10 / Purge Time: 3 Sample Date: 10/	30 PM	Sample Point I.D. SK-6 Casing Vol. (gals.): 1:32 gul Vol. Purged (gals.): 2.0 gul Sample Method: Eeflon barke
Sample Time: 3		
Elevation: Water Level: GW Elevation:	4.01	Total Well Depth: 12-12 Stick-Up: Sample Temp. (°C):
Weather Conditions:	Sanny wondy	,500/-
Sample Appearance:	Clear, slightly	in well
	Reason: Procedure/Proportions:	
рН		
Sp. Cond (umhos)		······································
Lab Comments:	(· 0.163 = Cis v=	olume -4.01) x C. (63
·		
certify that sampling procedu Sampler Name: (print)	res were in accordance with EP	A and corporate protocols. Signature Chiplew Netwe

Purge Date:	12/88	Sample Point I.D. 8-D Casing Vol. (gals.) 3.8 Vol. Purged (gals.) 11.4 Sample Method: Eefloa bail
Elevation: Water Level: GW Elevation:		Total Well Depth: 49.9 Stick-Up: ample Temp. (°C):
	Suncy , wordy , Class, low to.	
	Reason: Procedure/Proportions:	•
pH Sp. Cond (umhos)		
Lab Comments	· 0.163 = (15 Vil = (47.5 - 26. = 3.8 5.15	5) × 0./63
	res were in accordance with EPA an	

	10/12/8	<u> </u>	. Ca	sing Vol. (gals.);		·
Purge Time:			Vol	. Purged (gals.):	8.6	
Sample Date:	10/12/8	8		Sample Method:	tetion.	bails
Sample Time:	3:30				<u> </u>	·
Elevation				otal Well Depth:	45.3	/
Water Level	27.R'		<i>3</i>			
GW Elevation			Sam	nple Temp. (° C):		
Weather Conditions		Samuel	windy,	50°E		· <u></u>
Sample Appearance	<i>~ i</i>		turbid			. -
Sampler Comments:		11	· ·	cover.		-
•	MACA	2	21 11 12			-
	11					_
 able To Obtain Sample	(X):Rea	son		<u> </u>		
mple Composited (X):						_
The second of th		·				_
					: .	-
						-
pH _ Sp. Cond						-
рН _						-
pH _ Sp. Cond (umhos)		272				-
pH _ Sp. Cond			∴ 6 S			-
pH _ Sp. Cond (umhos)		272		1	0./63	-
pH _ Sp. Cond (umhos)		272	∴ 6 S	1	0./63	- - - -
pH _ Sp. Cond (umhos)		272	∴ 6 S	1	0./63	-
pH _ Sp. Cond (umhos)		272	∴ 6 S	1	0./63	-
pH _ Sp. Cond (umhos)		272	∴ 6 S	1	0./63	-
pH _ Sp. Cond (umhos)	h ·	N. No 3 =	^6 \\ (4.5.3 \\ - 2.9 \\ 5	-278) x		

/ / _	
Purge Date: 10/12/88	Casing Vol. (gals.): 3-06 gal
Purge Time: 1:00 PM	Vol. Purged (gals.): 10-0 gal
Sample Date: 10/12/88	Sample Method Lefton bail
Sample Time: 1:30 PM	· ·
Elevation:	Total Well Depth: 43.3
Water Level: 24.5	Stick-Up:
GW Elevation	
GW Clevation	Complex on p. (o,
	· · · · · · · · · · · · · · · · · · ·
Weather Conditions Sancy	windy 50°F
Sample Appearance: Clear	low tarbidity
Sampler Comments	· · · · · · · · · · · · · · · · · · ·
· · · · · · · · · · · · · · · · · · ·	
iable To Obtain Sample (X):Reason:	
mple Composited (X): Procedure/Pro	portions:
·	
	
рН	
,	
pH Sp. Cond (umhos)	
Sp. Cond	
Sp. Cond	
Sp. Cond	
Sp. Cond	
Sp. Cond	
Sp. Cond	
Sp. Cond	
Sp. Cond	
Sp. Cond. (umhos) Lab Comments	4,00 Vol (50/s) = 3.06 gal
Sp. Cond	ince with EPA and corporate protocois.
Sp. Cond	ince with EPA and corporate protocois.

INULL 2

Facility Name Safeta	- Kleen, Dollan, IL Sample Point 1.D. SK-
Purge Date	/88 Casing Vol. (gals.): 1.2
Purge Time: 4:10	
	188 Sample Method: Eeflon bailer
Sample Time 4: K	
Elevation:	Total Well Depth: 11.6
Water Level4	Stick-Up:
GW Elevation	
Weather Conditions:	Sunny wordy , 500F
Sample Appearance	Clear, up moderate turbidity
Sampler Comments	
Unable To Obtain Sample (X):	Reason:
	Procedure/Proportions:
рН	
Sp. Cond	
(umhos)	
·	
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PROJECT: 815

PART III

PROJECT MANAGEMENT PLAN

RCRA FACILITY INVESTIGATION
PHASE I RELEASE ASSESSMENT WORKPLAN
DOLTON RECYCLE CENTER



TriHydro Corporation

920 Sheridan Street Laramie, Wyoming 82070

(307) 745-7474 FAX: (307) 745-7729

PART III - PROJECT MANAGEMENT PLAN

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CHAPTER III-1

INTRODUCTION

Safety-Kleen Corp. (S-K) owns and operates a recycling facility (SIC 2851) in Dolton, Illinois. S-K has owned and operated the facility since March 1987. The Dolton Recycle Center occupies a 30-acre site in an industrialized area about 20 miles south of downtown Chicago, Illinois (Figure III-1-1). The address of the facility is:

Safety-Kleen Corp. 633 East 138th Street Dolton, IL 60419

The Dolton Recycle Center is a reclamation and recycling facility that accepts organic chemicals and solvent wastes from S-K service centers and other S-K recycle centers, and from industrial and commercial facilities. Spent materials brought to the facility are regenerated into product or blended for use as a fuel in cement kilns. Principal wastes managed at the facility are paint waste, lacquer thinner, mineral spirits, and waste oil.

RFI Objective

The Dolton Recycle Center is permitted to store and treat RCRA hazardous wastes (ILD980613913). As a condition of the RCRA permit, the Illinois Environmental Protection Agency (IEPA) requires S-K to conduct a RCRA Facility Investigation (RFI). The purpose of the RFI is to determine the nature and extent of releases of hazardous wastes and hazardous constituents from certain solid waste management units (SWMUs) and areas of concern (AOC) at the facility. The locations of the SWMUs and AOCs under investigation are shown on Figure III-1-2.

In order to achieve the RFI objective, Illinois Environmental Protection Agency (IEPA) designed a three-phase process and incorporated it into the Part B Permit:

Phase I - Release Assessment - Phase I is designed to provide information on the characteristics and integrity of each SWMU and to determine if a SWMU has released, is currently releasing, or has the potential to release hazardous waste and/or hazardous constituents to the soil or air.

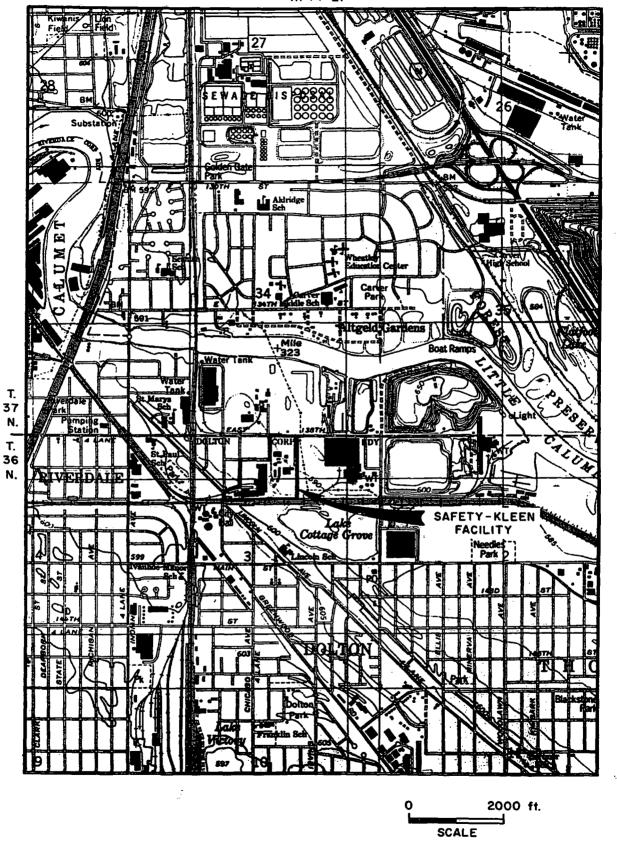
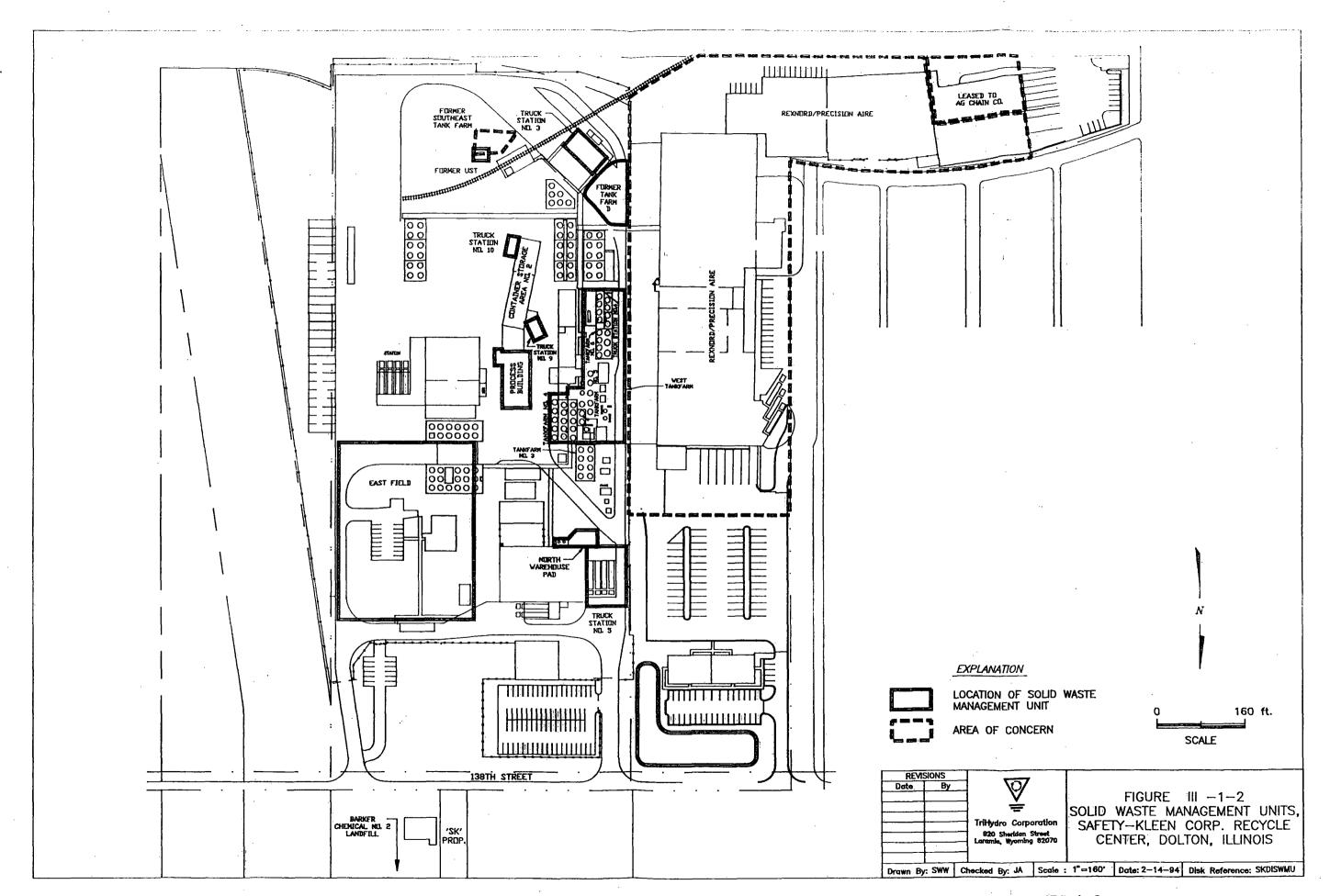


FIGURE III-1-1 :VICINITY MAP, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (ILD980613913)



- <u>Phase II Extent of Release Assessment Phase II</u> is designed to define the extent of releases (if any) to soil from the subject SWMUs.
- Phase III Ground-Water Release Assessment Phase III is designed to define the extent of releases to the ground water (if any) from SWMUs identified in Phase I or II to have potentially released hazardous waste or hazardous constituents to the ground water.

RFI Phase I Workplan Organization

The Phase I investigation will be conducted in accordance with this Phase I Release Assessment Workplan. The content of the Workplan follows the IEPA guidance in Attachment F of the Part B Permit, entitled "Required Scope of Work for a RCRA Facility Investigation." Therefore, the Dolton Phase I release assessment is designed to be consistent with Phase I release assessments at other facilities in Illinois. The Workplan contains the following parts:

- General Facility Information (Part I), which presents general information about present facility operations, previous facility operations, SWMU descriptions, and regional information.
- Nature and Extent of Impacts (Part II), which describes previous information on soils and ground water and information on potential migration pathways.
- Project Management Plan (Part III), which presents the objectives of Phase I and the project organization necessary to achieve the objectives.
- Sampling and Analysis Plan (Part IV), which describes the procedures to determine the presence or absence of a release of hazardous waste or hazardous constituents from SWMUs to soil or air. S-K has voluntarily expanded Phase I to include some ground-water assessment.
- Health and Safety Plan (Part V), which describes the procedures to protect the health and safety of those conducting field activities during Phase I.
- Data Management Plan (Part VI), which describes the techniques to document and track Phase I information, data, and conclusions.

 Quality Assurance/Quality Control Plan (Part VII), which details the procedures to ensure that information, data, and resulting conclusions are technically sound and properly documented.

CHAPTER III-2

PHASE I TECHNICAL APPROACH

The Phase I technical approach has been designed to achieve the Phase I objective and to be consistent with the IEPA guidance in Attachment F of the Part B Permit for the Dolton Recycle Center. The technical approach accommodates the physical and chemical conditions present at the facility, which are detailed in Parts I and II of this Workplan.

Phase I Scope

Sampling and analysis will be conducted according to the time schedule presented on Figure III-2-1. In order to achieve the Phase I objectives, the specific goals of the SAP are to:

- Collect soil samples from those accessible locations and depths which are most likely to permit identification and proper characterization of a SWMU-related release of hazardous wastes or hazardous constituents, if a release has occurred.
- Analyze the soil samples for the SWMU-related hazardous constituents which permit the identification, characterization, and hazard evaluation of a release.
- Implement sampling and analysis procedures which promote the quality assurance goals of completeness, representativeness, comparability, accuracy, and precision.

The soils data will also be used to determine the potential for a release to air, as described in the Data Management Plan (Part VI of the Workplan).

Although not required for Phase I by the Part B Permit, Safety-Kleen Corp. (S-K) intends to conduct voluntary ground-water assessment during Phase I to identify and characterize ground-water quality impacts and further evaluate ground-water flow directions in the shallow perched zone. This information will be used to design appropriate activities during subsequent phases of the RCRA Facility Investigation (RFI).

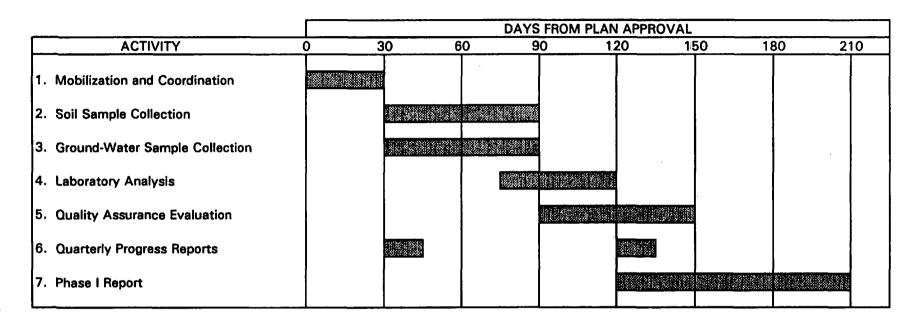


FIGURE III-2-1 :TIME SCHEDULE, PHASE I RELEASE ASSESSMENT, DOLTON RECYCLE CENTER

Sampling Locations

Sampling locations have been selected to provide an evaluation of worst-case conditions caused by a release or potential release of hazardous wastes or hazardous constituents. Sampling will take place in areas of known releases, in areas where previous field screening data indicate releases have occurred, and in areas where experience from similar sites indicates releases are most likely to occur.

Background Locations

The background sampling locations are shown on Figure III-2-2. The four background locations have been selected to satisfy the following criteria:

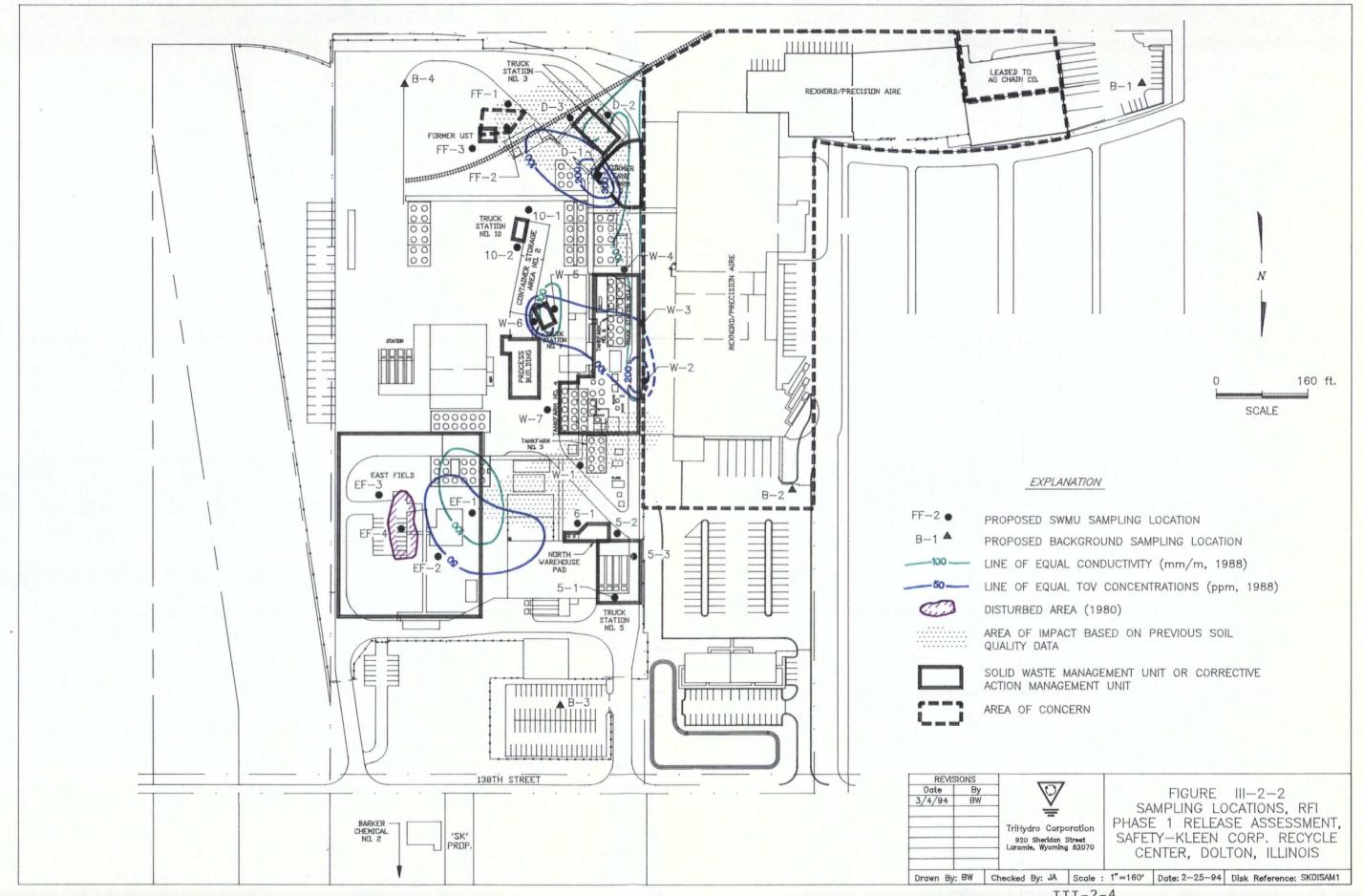
- Located on Dolton facility property to minimize uncertainties about prior uses in the background areas.
- 2. Located at least 50 feet from any SWMUs listed in the Part B Permit as modified by IEPA and S-K.
- 3. Located at least 50 feet from any current or past industrial activity, based on review of aerial photos.
- 4. Spatial distribution across facility.
- 5. Same soil textures as encountered in SWMU soil samples (because natural inorganic constituent concentrations are a function in part of soil texture).

Background locations will be sampled first to minimize the potential for cross-contamination. If the onsite geologist determines that background soil samples are of a different soil texture than SWMU soil samples, he/she will collect samples from other background locations in order to satisfy the five background selection criteria listed above.

SWMU Locations

Twenty-three locations south of 138th Street will be sampled to identify and characterize releases to soils and shallow perched ground water. Criteria used to select sampling locations are:

 Within or adjacent to SWMUs. For areas with secondary containment (truck stations and West Tank



Farm), sampling is planned next to the containment, because of access problems at several locations and concerns about damaging containment integrity at all locations.

- 2. In areas of known impact, based on previous soil data (Figure II-2-8) and ground-water data (Figure II-3-6).
- 3. In areas of suspected impact, based on information presented in Part II.
- 4. Areas where releases are more likely, which include valve locations where wastes are transferred between tank and tanker.

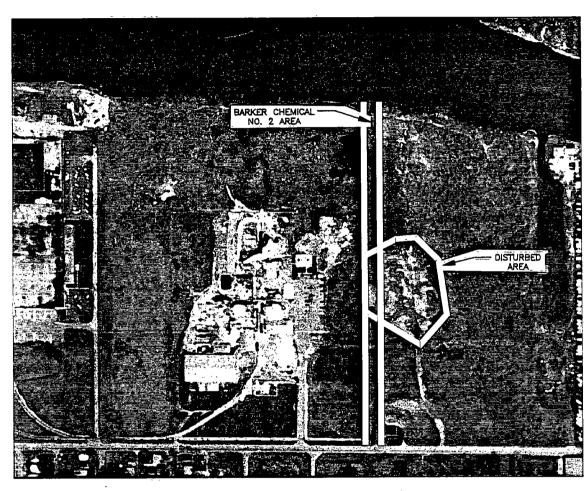
The 23 SWMU sampling locations south of 138th Street are shown on Figure III-2-2 along with much of the rationale used for selecting the locations.

Three locations will be investigated in the apparently disturbed part of the Barker Chemical No. 2 Area north of 138th Street to determine whether a SWMU is or was present on S-K property. Sampling locations are shown on Figure III-2-3. Two locations will be within the possible area of disturbance on an April 1980 aerial photo and along the eastern boundary of S-K property. The third location will be outside the apparent area of disturbance on the April 1980 aerial photo. The purpose for sampling this location will be to define native soil conditions in order to determine whether the other two locations are sited in backfill (possibly indicative of a SWMU) or native soil conditions. If there is a SWMU in the Barker Chemical No. 2 Area, sample collection and chemical analysis will be conducted.

Soil Sampling Depths

In the Barker Chemical No. 2 Area, soil samples will be collected at 5-foot intervals from ground surface to 20 feet below ground surface. The onsite geologist will evaluate soil texture and field-screen the samples according to the procedures in Chapter IV-2. Based on this information, the geologist will determine if the SWMU is on S-K property, and subject to the soil sampling procedures described below. If no SWMU is present on S-K property (Barker Chemical No. 2 Area), no soil sample collection and laboratory analysis will be performed in this area.

Soil sampling will occur during the Phase I Release Assessment to identify and characterize releases from Dolton



1980

FIGURE III-2-3 :LOCATION MAP, BARKER CHEMICAL NO. 2 AREA (April 1980 Aerial Photo)

facility SWMUs. In addition, soil sampling and analysis will be conducted to define the vertical extent of soil impacts.

Soil samples will be collected at about 2 feet and 20 feet below ground surface for chemical analysis. Data from the shallow depth will be used to identify soil impacts, and data from the greater depth will be used to define extent. The deep sample at each location will be field screened, and a deeper sample will be collected if necessary to define the vertical extent of impacts.

During the sampling program, the onsite geologist will evaluate the range of soil textures from the background locations to ensure that they match the range of soil textures encountered in soil samples underlying the SWMUs. If they do not match, additional background intervals and/or locations may be sampled to ensure a match.

Ground-Water Sampling Depths

A ground-water level will be measured and a water sample collected at all background and SWMU locations south of 138th Street where ground water is present in the perched zone (historically 1 to 5 feet below ground surface). Ground-water samples will be collected from the perched zone at approximately 5 to 10 feet below ground surface. In the Barker Chemical No. 2 Area north of 138th, ground-water levels will be measured and water samples collected only if perched ground water is present and if the SWMU is determined to be on S-K property.

Laboratory Analysis

Samples will be submitted to S-K Environmental Laboratory for chemical analysis. The laboratory is located in Elk Grove Village, Illinois. The samples to be analyzed are shown in Table III-2-1. The samples will be analyzed for the 107 constituents described in Table III-2-2.

Table III-2-1. Sampling and Analysis Matrix, RFI Phase I Workplan, Dolton Recycle Center.

			Investigative Samples		Field Quality Control Samples				
Sample Matrix	Field Parameters	Lab Parameters	Туре	No. of Sites	No. per Site	Total	Trip Blanks	Equipment Blanks	Field Duplicates
	Physical Descriptions								
	Total Organic Vapors		BG Swmu	4 23-25	2 2	8 46-50	0	0	5
		Volatile Organic Compounds Semi-Volatile Organic Compounds Inorganic Compounds, Total	BG Swmu	4 23-25	2	8 46-50	0	0	5
Ground Water	Water Levels		BG Swmu	4 23-25	1 1	4 23-25	0	0	3
	Physical Descriptions	Volatile Organic Compounds	BG		4				7
		Semi-Volatile Organic Compounds Inorganic Compounds, Dissolved	SWMU	23-25	i	23-25	,	,	

Notes:

- 1. The number of sites depends on whether a SWMU exists in the Barker Chemical No. 2 Area on S-K property, and thus is subject to this investigation.
- 2. Laboratory control samples are described in Appendix VII-A.
- 3. BG means background. SWMU means solid waste management unit.

Table III-2-2. Constituent List, RFI Phase 1 Release Assessment, Dolton Recycle Center.

Constituent	Method (from SW-846)	Method Detection Limit (mg/kg)		
Inorganics				
Arsenic	7060	1.25		
Barium	6010	2.0		
Cadmium	6010	2.0		
Chromium	6010	4.0		
Lead	6010	11.0		
Mercury	7471	0.04		
Selenium	7740	0.9		
Silver	6010	3.0		
Organics*				
Volatile Organic Compounds (37) Semi-Volatile Organic Compounds (62)	8240 8270	0.005-0.100 0.33-3.3		

^{*} A complete list of organic compounds and method detection limits for individual compounds are presented in Appendix IV-C.

CHAPTER III-3

PHASE I REPORTING

Phase I includes a single, extensive soil and ground-water sampling and analysis event. A report on this event, including all field observations, laboratory data, and quality assurance evaluations, will be submitted to the Illinois Environmental Protection Agency (IEPA) within 90 days of receipt of the complete set of soil quality data. The Phase I Report will provide a summary of the Phase I investigation, problems and responses, staffing changes, and a schedule of upcoming activities. The report will include conclusions on whether a release of hazardous wastes and/or hazardous constituents has occurred to soils, ground water, or air, and whether the release has the potential to impact ground water in the dolomite aquifer.

Quarterly progress reports will be submitted to update IEPA on the progress of Phase I activities. Information included in the reports will be percentage of the project completed, activities completed during the reporting period, changes in the implementation of the Workplan, problems encountered during the reporting period, proposed corrections to these problems, projected work for the next reporting period, and any other pertinent information.

CHAPTER III-4

MANAGEMENT ORGANIZATION

Figure III-4-1 presents the proposed project management structure for the implementation of the RFI. The project will be directed by Mr. Scott Davies, Senior Project Manager - Remediation for Safety-Kleen Corp. (S-K). Mr. Davies has 8 years of experience in the environmental field and is responsible for cleanups and closures of S-K recycle centers throughout the United States and Puerto Rico.

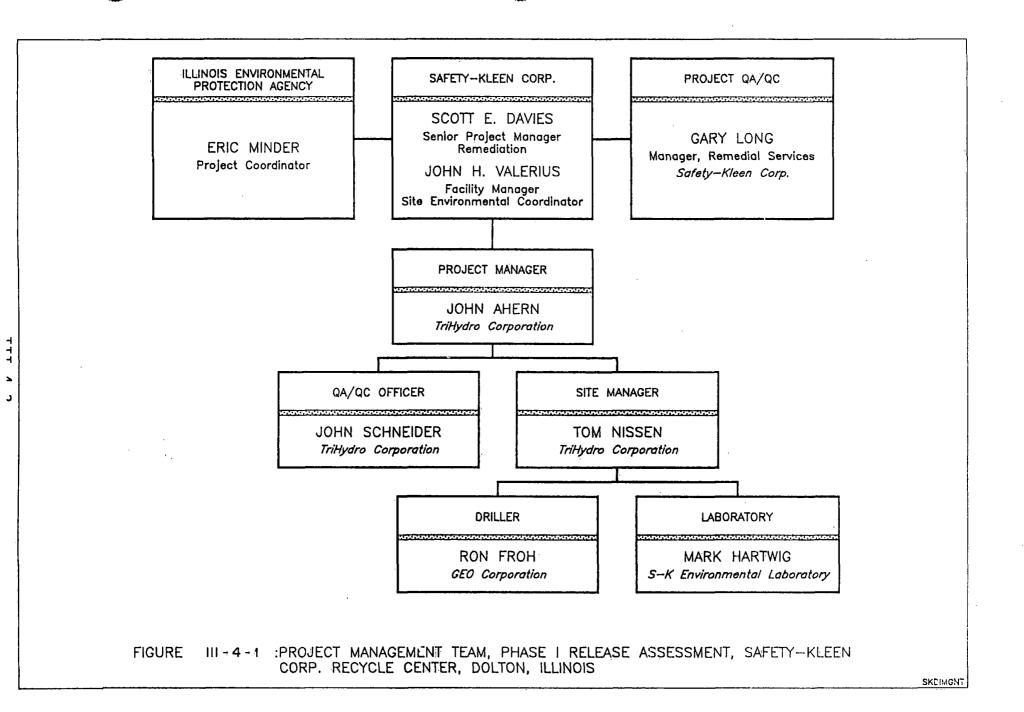
Mr. Davies will be assisted by John Valerius, the Facility Manager at the Dolton Recycle Center. Mr. Valerius has more than 15 years of experience in waste management.

The IEPA Project Coordinator (Eric Minder) will ensure that the RFI project is conducted in accordance with the RCRA regulations and in general accordance with RFI guidance documents. The IEPA Project Coordinator will modify the RFI Workplan as needed, make site visits, and critically review the final report to ensure that the quality assurance objectives have been achieved.

The IEPA Project Coordinator and the S-K Project Director may conduct audits of field and laboratory activities.

S-K has developed an experienced project team in order to promote quality assurance during the RFI process. All team members have worked together on RFIs at other petroleum-impacted sites. The principal team members are:

- TriHydro Corporation will function as the prime contractor. TriHydro will be responsible for the proper implementation of the Phase I Workplan, collecting soil samples and submitting them to the laboratory, auditing laboratory performance, and preparation of the RFI report. In addition to working with S-K at the Dolton site, TriHydro is conducting assessment and/or remediation projects at 40 other S-K sites throughout the central and western United States. A summary of TriHydro qualifications and resumes of personnel to be involved in the project are included in Appendix III-A.
- <u>GEO Corporation</u> will perform the drilling services. As described in Appendix III-B, GEO Corporation has the specialized equipment to enter and drill in tight locations and has experience in drilling at petroleum-contaminated sites.



• <u>S-K Environmental Laboratory</u> will perform all laboratory analytical services. S-K Environmental Laboratory is performing the analytical services on many of S-K's monitoring, assessment, and remediation projects in the region. S-K Environmental Laboratory qualifications are summarized in Appendix III-C.

TriHydro Corporation

John Ahern, President of TriHydro Corporation, will be TriHydro's project manager for the RFI Phase I project. Mr. Ahern has 20 years of experience in assessment and remediation at petroleum-impacted sites. He has served as project manager and/or QA/QC officer on 25 Safety-Kleen projects over the previous two years. Mr. Ahern is located at the TriHydro Corporation office in Laramie, Wyoming, and will provide all onsite project personnel from this office.

Activities to be performed by the Project Manager during the RFI include:

- Select, coordinate, and schedule staff for the work assignments.
- Control budgets and schedules.
- Prepare bimonthly progress reports.
- Monitor the subcontractor.
- Implement quality assurance measures and any corrective action requirements.
- Attend review meetings.
- Perform final data assessment.
- Supervise the preparation of the RFI report and provide technical peer review.

Under the direct supervision of the project manager is the QA/QC officer and the site manager. Mr. John Schneider will serve as the project QA/QC officer. The activities presented below will be completed by the project QA/QC officer:

 Audit field memoranda prepared by field personnel to assure that the procedures for sample collection and sample custody are strictly adhered to.

- Review laboratory reports to assure that adequate QA/QC procedures are imposed on the laboratory analytical results.
- Interface with IEPA's QA Officer and Project Manager, when necessary.
- Organize the final evidence file, and turn over the custody of this evidence file to S-K's Project Manager at the end of the project.

Mr. Tom Nissen will serve as the project's site manager. Mr. Nissen has six years of experience directing field activities for environmental assessment and remediation at RCRA facilities. Mr. Nissen will be responsible for all onsite activities including scheduling, direction of the subcontractors, and maintaining the sampling procedures in accordance with the Quality Assurance Project Plan (Part VII) and the Sampling and Analysis Plan (Part IV).

GEO Corporation

GEO Corporation will conduct the soil and ground-water sample collection required during the RCRA Facility Investigation. GEO Corporation has custom-designed equipment for field sampling and can match the field sampling equipment to the particular task, type of sample needed, and site conditions. During the Phase I investigation, a Scorpion Series ATV Hydraulic Probing Rig will most likely be used to allow access to the tighter areas. A detailed explanation of soil and ground-water sample collection is described in the Sampling and Analysis Plan (Part IV).

S-K Environmental Laboratory

S-K Environmental Laboratory will conduct the laboratory services required during the RCRA Facility Investigation. The laboratory organization structure and internal responsibilities are described in detail in Appendix III-C.

CHAPTER III-5

COST ESTIMATE

The cost estimate for implementation of Phase I is presented in Table III-5-1. The estimate is organized per the field activities in the Sampling and Analysis Plan(Part IV) and reporting activities in the Project Management Plan (Part III). Safety-Kleen Corp. (S-K) has adequate resources to complete the Phase I release assessment.

S-K will submit financial assurance for completion of the Phase I release assessment in accordance with Paragraph IV.D.2 of the Part B Permit (Financial Assurance for Corrective Action). The documentation for financial assurance will be submitted by S-K within 60 days of approval of this Phase I Release Assessment Workplan by the Illinois Environmental Protection Agency.

Table III-5-1. Cost Estimate Worksheet, RFI Phase I Release Assessment, Safety-Kleen Corp. Recycle Center, Dolton, Illinois.

Phase/Activity	Cost
	•
I. Phase I Investigation	
Activity I.1 - Pre-Field Activities	\$500
Activity I.2 - Sample Collection/Decontamination	19,500
Activity I.3 - Field Documentation/Chain-of-Custody Control	500
Activity I.4 - Post-Field Activities	300
Activity I.5 - Laboratory Analysis (\$645/soil sample)	40,600
	\$61,400
II. Reporting	
Activity II.1 - QA/QC analysis per QAPjP	\$1,900
Activity II.2 - Prepare Phase I Report	2,700
Activity II.3 - Prepare 2 quarterly progress reports	1,000
Activity II.4 - Compile data package and ship to facility	800
	\$6,400
Cost Estimate Worksheet Summary	
1) Phase I Investigation	\$61,400
2) Reporting	6,400
	\$67,800

Note: S-K is conducting ground-water activities voluntarily under Phase I, and thus costs for ground-water sampling, analysis, and reporting are not included.

APPENDIX III-A
TRIHYDRO QUALIFICATIONS

Summary of Current TriHydro Clients

Client/Sites	Starting Date	Principal Services
Wyoming Department of Environmental Quality	_	
- Mountain View	1988	Contaminant source identification
- Laramie (Foster's Sinclair)	1990	Vapor and ground-water quality assessment, design and construction of trench to intercept vapors and hydrocarbon product
- Greybull	1992	Emergency response, design, and installation of residential vapor controls
Texaco Refining and Marketing, Inc.	_	
- Los Angeles Refinery (California)	1985	Hydrocarbon recovery, soil remediation, environmental assessment, regulatory reporting, ground-water monitoring
- El Dorado Refinery (Kansas)	1987	Hydrocarbon recovery, environmental assessment, air monitoring, vapor control, regulatory reporting
- Lockport Refinery (Illinois)	1985	Environmental assessment, regulatory reporting, NPDES evaluation, RCRA
- Bakersfield Refinery (California)	1992	Soil and ground-water quality remediation, environmental assessment
Golden West Refining Company	_	
- California Refinery	1985	Hydrocarbon recovery, environmental assessment, regulatory reporting, expert witness testimony, ground-water monitoring
Safety-Kleen Corp.	_	
- 40 sites (principally Midwest)	1988	RCRA closures, UST environmental assessments, regulatory reporting, soil remediation, ground-water remediation, RFIs
Sinclair Oil Corporation	_	
- Sinclair Refinery (Wyoming)	1985	Environmental assessment, ground-water monitoring, RCRA and State permitting, RF1, regulatory reporting
- Boise, Burley Terminals (Idaho)	1991	Environmental assessment
Miscellaneous Clients		
- Banner Associates (Wyoming)	1991	Municipal ground-water development
- Church and Dwight (Wyoming)	1991	Landfill permit, spill control plan at trona site
- D&B Services (Wyoming)	1992	Environmental assessment at oil field
- Enron (Colorado)	1991	UST environmental assessment
- First Interstate Bank	1992	Environmental audits

Summary of Current TriHydro Clients (continued)

Client/Sites	Starting Date	Principal Services
- Forsgren Associates (Wyoming)	1990	Municipal ground-water development
- Frontier Refining (Wyoming)	1991	Ground-water monitoring, RFI at petroleum refinery
- Holly Sugar Corporation (Wyoming, California, Montana)	1987	Ground-water assessment and monitoring, landfill permit
 Indian Refining Company (Illinois) 	1985	RCRA closures, environmental assessments, waste management plans at petroleum refinery
- Koch Materials (Colorado, Kansas)	1991	Site assessments at asphalt plants
- Marathon Oil (Nebraska)	1992	Ground-water monitoring at oil/gas production site
- Shell Pipe Line Corp. (Wyoming)	1991	Assessment and remediation of crude oil spill
- Texaco Inc. (California)	1990	Expert witness testimony for tank farm
- Wheatland (Wyoming)	1987	Landfill permit and ground-water monitoring
- Wyoming Territorial Prison	1991	Ground-water monitoring

APPENDIX III-B
GEO CORPORATION QUALIFICATIONS



CORPORATE OFFICES

ROCKY MOUNTAIN REGION
400 Corporate Circle, Suite F
Golden, Colorado 80401
303-279-4655
1-800-872-6662

REGIONAL OFFICES

SOUTHWEST REGION Houston, Texas 713-6682-6996 FAX # 713-682-6982

GREAT LAKES REGION Detroit, Michigan 313-344-2110 313-344-1117

WESTERN REGION
Salt Lake City, Utah
801-566-4590

SOUTHEAST REGION Atlanta, Georgia 404-425-2828 FAX # 404-425-4686

CENTRAL REGION St. Loius, Missouri 314-890-0038

DISTRICT OFFICES

SOUTHWEST DISTRICT OFFICE Baton Rouge, LA

SOUTHEAST DISTRICT OFFICE Charlotte, NC

PROPOSED EXPANSION OFFICES:

SOUTHEAST DISTRICT OFFICE Orlando, Florida

GREAT LAKES DISTRICT OFFFICE Chicago, Illinois

Field Sampling Equipment

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GEO Environmental has custom designed its equipment for field sampling and analysis. GEO matches field sampling equipment to the needs of the client, the type of sample taken, and the terrain on the job site. The following is a list of the kind of equipment available.

Scorpion Series-ATV Hydraulic Probing Rig

* Weight: 1200 lbs * Height: 8 feet * Length: 89 inches 43 inches * Width:

Sampling Capability

* Soil vapor to 30 feet.

* Soil sampling continuous or interval to 30 feet.

* Groundwater sampling - real-time/temporary monitoring to 30 ft.

* Expendable Aquifer Sampling Implant: EASI system/10-30 per day

* GEOpunch real-time bailed water samples to 30 feet * 1", 3/4", 1/2" factory-slotted PVC, set to 30 feet * Soil vapor sampling by passive and dynamic methods

* Soil vapor monitoring by temporary or permanent techniques

Viper Series - 1 Ton 4x4 hydraulic probing rig

- * Vehicle: rig is mounted on 1 ton 4x4 Ford F-350 pickup bed
- * Engine: V-8, 460 * Mast height: 9 feet

Sampling Capability

* Soil vapor to 60 feet.

* Soil sampling continuous or interval to 60 feet.

* Groundwater sampling - real-time/temporary monitoring to 30 ft.

* Expendable Aquifer Sampling Implant: EASI system/10-30 per day

* GEOpunch real-time ground-water samples using bailer.

* 1", 3/4", 1/2" factory-slotted PVC

* Soil vapor sampling by passive and dynamic methods

* Soil vapor monitoring by temporary or permanent techniques

Steam Cleaner

* For decontaminating probe rods and samplers

* Hotsy/Landa models

* Hot (up to 200°F) and cold rinse capable 2500 psi washing pressure

* 200 gallon water tank

APPENDIX III-C S-K ENVIRONMENTAL LABORATORY QUALIFICATIONS

Safety-Kleen QAP 2/94 Revision: 0 Date: 2/14/94 Section: 4 Page 1 of

4.0 ORGANIZATION AND RESPONSIBILITY

It is the objective of Safety-Kleen Corp. to provide an organizational structure that can enhance the attainment of Corporate goals. Quality services, cost competitiveness, client satisfaction, employee gratification and profitable operations are primary Safety-Kleen goals.

4.1 DESCRIPTION OF LABORATORY PERSONNEL RESPONSIBILITIES

Safety-Kleen's Environmental Laboratory, located in Elk Grove Village, Illinois, is a full-service environmental analytical laboratory. A total staff of 26 people, consisting of laboratory personnel and/or support personnel managed by Mr. Mark A. Hartwig provide environmental services to industrial and internal clients. The Environmental Laboratory has state certifications for the analysis of soils, waste water and/or drinking water in Connecticut, California, Illinois, Kansas, New York and Wisconsin. Also, all those states that recognize any of the previous mentioned states in reciprocity. We are accredited by the American Association for Laboratory Accreditation (A2LA). This enables the Environmental Laboratory to conduct analyses for internal and client projects throughout much of the country.

4.1.1 PROJECT MANAGEMENT

Safety-Kleen's Environmental Laboratory uses a system of lab managers and project managers to plan, coordinate, execute and monitor project activities. Efficient and effective project management is of prime importance to the successful execution of project establishing and maintaining credibility and lasting value. Project management at Safety-Kleen is the coordinated and cooperative effort of a team, in which each member actively participates in successful project planning and execution. Project Managers are involved from the start in planning the project and time tables. When the client proposal is accepted by the client, the lab project manager will schedule with the client the arrangements for supplying sample containers and a schedule for sampling.

When samples are received at Safety-Kleen's Environmental Laboratory, the sample custodian will verify that all sample container seals are intact, and if so, will sign the chain-of-custody statement accordingly. In the event that it appears chain-of-custody has been broken, the sample custodian will immediately bring it to the attention of the Project Manager who will in turn contact the client for consultation and resolution. Written documentation of the event will be furnished.

The sample custodian will also verify information on the sample labels is the same as that appearing on the chain-of-custody. Any inconsistencies will also be brought to the attention of the Project Manager for immediate resolution with the client. The resolution will be documented in a memorandum to the project file and a copy provided to the client. After log-in, the samples are stored at 4°C in storage refrigerators until analysis.

The sample identification information and analyses requested are then logged into the laboratory computer and entered onto the laboratory backlog. The laboratory backlog serves as a guide to the Laboratory Manager, Group Leaders and Project Managers to identify the status of all samples in the laboratory, and is used to ensure that project deliverable requirements are met. The backlog contains the laboratory sample work order number, client name, number of samples received by matrix, number of samples to be analyzed for each requested parameter, due date, type of QC and report requested.

Backlogs are updated daily and reviewed by the Environmental Laboratory Project Manager and group leaders. The responsibility of the Project Manager is to monitor the status of samples using the backlog report, daily status meetings and through status updates from the Laboratory Manager. Use of the backlog allows the Project Manager to track the progress of samples through the various steps of the analytical process and assure timely completion of each task. If for any reason the backlog indicates that sample analyses are not completed within seven days of the due date, the Project Manager will work with the Laboratory Manager and Group Leaders to reassess laboratory priorities to enable timely delivery of the analytical report. The laboratory manager and group leaders have a commitment to maintain project schedules with a goal of 100% on-time delivery of quality data packages. If at any time, a delay in the required project turnaround time is anticipated, the Project Manager will immediately contact the client and inform them of the nature of the problem, the corrective action taken and a revised delivery date for the analytical data report.

A flexible capacity helps the laboratories meet project commitments. The Environmental Laboratory operates two shifts, 5 days per week in many of the service areas. The shifts are 8 hours shifts. Capacity is expanded by using autosamplers on many of the instruments. As demand for specific analytical requirements grows, the Environmental Laboratory has added equipment and full time staff as analytical backlog is identified.

4.1.3 KEY PERSONNEL

The Environmental Laboratory provides ongoing training to maintain the quality of its personnel. The highly trained staff of experienced professional chemists and technicians is the key element in the lab's credibility as a provider of quality environmental testing service. A strong base of experience, organized and managed effectively, results in a value added service product appreciated by our clients. The accompanying Skills Matrix of Key Personnel summarizes the education and experience of the laboratory personnel. The Laboratory personnel assigned to this project have an excellent record of satisfying project requirements. The Group Leaders provide guidance and direction enabling their staff to routinely provide quality test results.

Table 4-1 provides the skills matrix of key laboratory personnel.

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Table 4 - I

Skills Matrix of Key Personnel
SAFETY-KLEEN CORP.
February 14, 1994

	DEGREE	YRS LAB EXP	PROJ MNGT	QA /Q C	DATA MNGT	CLP EXP	SW846 EXP	EPA 600 EXP	DOD EXP	A.F. IRP EXP	INDST HYG EXP
<u>Laboratory Manager</u> Mark Hartwig	BS Chem	20	х		х	х	x	х			X
VP Technical James Breece	Ph.D. Chem	31	х	x	х		х		ţ		
OA/OC Manager Dave Reese	BS Chem	15	х	х	х	х	x	x	×		
Inorganic Group Leader Rita Shah	BS Chem	11	х	x		х	x		,		х
Organic Group Leader Rick Cook	MS Chem	14	x	x	х	x	x	x			x
Project Manager Matt Schweik	BS Economics										:
<u>Chemist</u> Pravin Patel	MS Chem	11		х			х				
<u>Chemist</u> Atul Shah	BS Chem	23				х	х	х			х
Chemist Mark Scheuer	MS Chem	8				х	х				x

RESUME

Atul Shah GC/MS Chemist TCLP/Environmental Laboratory

EDUCATION:

Bombay University
Bombay, India
B.S. Major - Chemistry
Minor - Botany

PROFESSIONAL AFFILIATIONS:

American Chemical Society

EMPLOYMENT HISTORY:

June 1991 - Present

Safety-Kleen Corp.

P.O. Box 92050

Elk Grove Village, IL 60009-2050

Position: GC/MS Chemist

Responsibilities:

- 1. Scheduling work for TCLP/VOA analysis.
- Preventive maintenance on GC/MS, Tekmar & Data System.
- Data Review/reporting.
- 4. Training to new operator/technicians.
- PE/QC samples data reporting.
- 6. Purchasing routine/new items.
- 7. Communicating to lab manager/group leader.
- 8. Learning new system/software (target).

March 1990 - May 1991

I.E.A. Illinois Inc. Schaumburg, IL 60195

Responsibilities:

- 1. TCLP/VOCs analysis by using:
 - a. EPA methods 8240/524.2/624
 - b. H.P. GC/MSD with RTE-A System
 - c. Tekmar's LSC 2000 and ALS 2016
- 2. Also familiar with BASE-NEUTRAL/ACID analysis by GC/MS.

1989 - March 1990

Responsibilities:

- 1. Working with Finnigan ITD 700 using EPA 524.2 method.
- 2. As a back-up Operator for INCOS 50.
- 3. Familiar with FORMASTER and HPs MSD.

Responsibilities:

- 1. Initiated, organized and established an efficient GC section for analysis of VOCs, PCBs, Pesticides, Herbicides, PAH, etc. by EPA methods.
- Trained and supervised three technicians.
- 3. Automated the GCs operation by adding Autosamplers and a multitasking PC based software.
- 4. Troubleshooting and routine maintenance.
- 5. Familiar with industrial hygiene samples with NIOSH methods.

1983 - 1984

Responsibilities:

1. Metal digestion analysis. Trained for GC analysis.

1982

Responsibilities:

1. Wet chemical analysis.

1974 - 1982

S. Merck Chemical Baroda, India

Position: Analytical Chemist

Responsibilities:

- 1. Wet chemical analysis of fine chemicals. Organicinorganic acids, solvents, Vitamin C, etc.
- 2. Instruments used include: Karl Fisher, Flame Photometer, GC.

1973 - 1974

Themis Pharmaceuticals Bombay, India

Position: R & D Chemist

Responsibilities:

 Product Development of paracetamol, phenacetin, phenylbutazone, oxyphenyl butazone.

RESUME

Mark A. Hartwig Manager TCLP/Environmental Laboratory

EDUCATION:

Eastern Michigan University Ypsilanti, Michigan B.S. Major - Chemistry Minor - Math, Business

PROFESSIONAL AFFILIATIONS:

American Chemical Society
American Society for Mass Spectrometry
MCM Local Mass Spectrometry Discussion Group

EMPLOYMENT HISTORY:

October 1991 - Present Safety-Kleen Corp. 12555 W. Old Higgins Road Elk Grove Village, IL 60007

Position: TCLP Manager

Responsibilities:

- Manage operation of environmental laboratory.
- Prepare annual business plans and operational budgets.
- 3. Develop staff and departmental functions.
- 4. Prioritize and monitor laboratory production to ensure timely completion of reports.
- 5. Ensure implementation of analytical testing capabilities.

December 1990 - April 1991

IEA, Inc.

126 West Center Court Schaumburg, IL 60195

Position: Director of Operations - Illinois

Responsibilities:

- 1. P & L of laboratory.
- 2. Business development.
- Ensure professional growth and development of staff.
- 4. Prepare and review capital equipment authorization for expenditure.

April 1991 - October 1991

IEA, Inc.

126 West Center Court Schaumburg, IL 60195

Position: Director of Midwest Region Business Development

Responsibilities:

- 1. Develop and maintain high level business relationships with Fortune 500 accounts.
- 2. Prepare and deliver sales presentations to major accounts.
- 3. Development of new product and service offerings.
- 4. Strategic market review and assessment.

July 1988 - December 1990

York Laboratories of Chicago, Inc.

126 West Center Court Schaumburg, IL 60195

Position: President and founder of York Laboratories of

Chicago, Inc.

Responsibilities:

1. P & L of the Laboratory.

2. Strategic Marketing Decisions.

- 3. Ensure professional growth and development of staff.
- 4. Approve major capital expenditures.
- 5. Serve on York Laboratories Strategy Development Team.
- 6. Serve on YWC, Inc., Steering Committee.

August 1981 to July 1988

Hewlett-Packard Company 1200 East Diehl Road Naperville, IL 60566

Position: Systems Engineer, GC/MS Product Line

Responsibilities:

- 1. Pre/Post Sales Support on all GC/MS instruments for MidWest Sales Region.
- 2. Provide technical consulting and applications support to Industrial and Governmental clients.
- 3. Assist in the development and testing of new hardware and software for all GC/MS systems.
- 4. Participate at trade shows and conferences by presenting technical papers and conducting technical workshops.

May 1974 to August 1981
Kemron Environmental Services
32740 Northwestern Highway
Farmington Hills, Michigan 48024

Position: Manager - Organics Analysis Laboratory

Responsibilities:

Coordinate and Execute the analysis of Industrial Hygiene and Environmental samples for organic contaminants by GC, IR, UV, GC/MS techniques.

AWARDS:

American Chemical Society Undergraduate Award in Analytical Chemical, 1973.

PUBLICATIONS:

"Use of Isooctyl Thioglycolate for the Separation of Tin and Antimony", Mark A. Hartwig, K. Rengan, J. Radioanalysis Chem. 42 (1978).

"Interfacing of an Hewlett Packard GC/MS with a HP-1000A Computer System to a Vax Computer and DEC Lims" Sunil Srivastava, Dennis Couch, Mark A. Hartwig, Scientific Computing and Automation Conference and Exposition (October 1988).

"Analysis to Phenols", Mark A. Hartwig, Hewlett-Packard Publication #23-5953-8056, (August 1982).

"Tuning the MSD to Meet DFTFF", Mark A. Hartwig, Hewlett Packard Publication AB85-12, (1985).

"Writing Procedure Files for the HP-1000 RTE VI GC/MS Data System", a Workshop, Mark A. Hartwig, Hewlett-Packard Company, ASMS Annual Conference, Cincinnati, Ohio (June 1986).

"Interpretation of Toxic Organic Data", Mark A. Hartwig, Annual Meeting-Academy of Certified Hazardous Materials Managers, July 1989.

"Running a Successful Environmental Laboratory", Mark A. Hartwig, Hewlett-Packard Seminar Series "ENVIRO-90", Cleveland, Cincinnati, St. Paul, Lansing, Michigan (November 1989).

"Productivity Gains through Quality Control", Mark A. Hartwig, HAZMAT-CENTRAL, Rosemont, Illinois (March 14, 1990).

RESUME

Rita Shah Inorganic Group Leader TCLP/Environmental Laboratory

EDUCATION:

University of Bombay Bombay, India B.S. in Chemistry and Biology

PROFESSIONAL AFFILIATIONS:

American Chemical Society

EMPLOYMENT HISTORY:

March 1991 - Present Safety-Kleen Corp. 12555 W. Old Higgins Rd. Elk Grove Village, IL 60009-2050

Position: Inorganic Group Leader

Responsibilities:

- 1. Supervise TCLP extraction and metals analysis area.
- 2. Troubleshoot difficult to handle filter wastes.
- 3. Train staff in sample prep and metals analysis.
- 4. Order and maintain supplies necessary for prep and metals analysis.
- 5. Maintain and troubleshoot ICAP and AA.

1987 - March 1991

Caremark Inc., Baxter Buffalo Grove, IL

Position: Sr. Analytical Chemist

Responsibilities:

- 1. Performance of stability studies and collection and documentation of data.
- Coordinator for various testing protocols for stability studies.
- 3. Responsible for methods development and assay troubleshooting.
- 4. Training and supervision of new personnel.

1982 - 1987

Chemical Waste Management Riverdale, IL

Position: Analytical Chemist

Responsibilities:

- 1. Analysis of hazardous waste according to CLP protocol using ICP and AA.
- 2. Trained and supervised others in operation of ICP and AA. Familiar with QA/QC in the laboratory.

1976 - 1981

Haffkine Bio-Pharm Bombay, India

Position: Quality Control Chemist

Responsibilities:

1. Performed analysis of raw materials, intermediates and packed products according to Pharmacopeia. Performed stability testing of packed products.

HONORS:

Published paper on interferences in graphite furnace at Pittsburgh Conference in March 1986.

PROJECT: 815

PART IV

SAMPLING AND ANALYSIS PLAN

RCRA FACILITY INVESTIGATION
PHASE I RELEASE ASSESSMENT WORKPLAN
DOLTON RECYCLE CENTER



TriHydro Corporation

920 Sheridan Street Laramie, Wyoming 82070

(307) 745-7474 FAX: (307) 745-7729

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CHAPTER IV-1

SAMPLING LOCATIONS

The Sampling and Analysis Plan (SAP) provides the procedures to generate the data necessary to achieve the Phase I objectives. As stated in the Project Management Plan (Part III), the Phase I Release Assessment objectives for the Dolton Recycle Center are:

- To determine if a release of hazardous waste or hazardous constituents has occurred, is occurring, or could occur from solid waste management units (SWMUs) to soils or air at the Dolton Recycle Center.
- If a release from a Dolton SWMU has occurred, to determine its degree of hazard, based on established corrective action limits.

Sampling and analysis will be conducted according to the time schedule presented on Figure IV-1-1. In order to achieve the Phase I objectives, the specific goals of the SAP are to:

- Collect soil samples from those accessible locations and depths which are most likely to permit identification and proper characterization of a SWMU-related release of hazardous wastes or hazardous constituents, if a release has occurred.
- Analyze the soil samples for the SWMU-related hazardous constituents which permit the identification, characterization, and hazard evaluation of a release.
- Implement sampling and analysis procedures which promote the quality assurance goals of completeness, representativeness, comparability, accuracy, and precision.

The soils data will also be used to determine the potential for a release to air, as described in the Data Management Plan (Part VI of the Workplan).

Although not required for Phase I by the Part B Permit, Safety-Kleen Corp. (S-K) intends to conduct voluntary ground-water assessment during Phase I to identify and characterize ground-water quality impacts and further evaluate ground-water flow directions in the shallow perched zone. This information will be used to design appropriate activities during subsequent phases of the RCRA Facility Investigation (RFI).

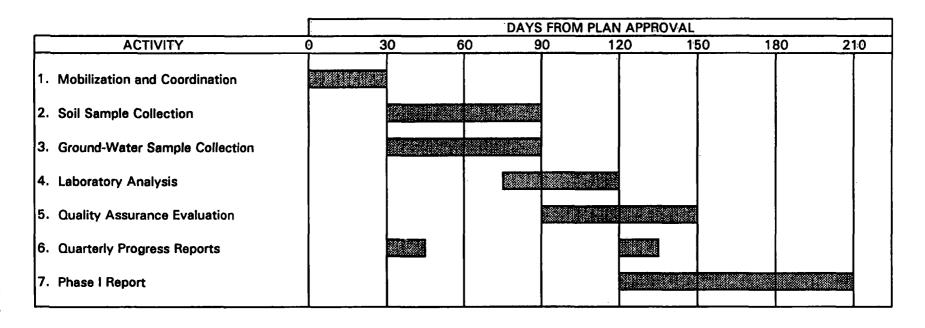


FIGURE IV-1-1 :TIME SCHEDULE, PHASE I RELEASE ASSESSMENT, DOLTON RECYCLE CENTER

Sampling Locations

Sampling locations have been selected to provide an evaluation of worst-case conditions caused by a release or potential release of hazardous wastes or hazardous constituents. Sampling will take place in areas of known releases, in areas where previous field screening data indicate releases have occurred, and in areas where experience from similar sites indicates releases are most likely to occur.

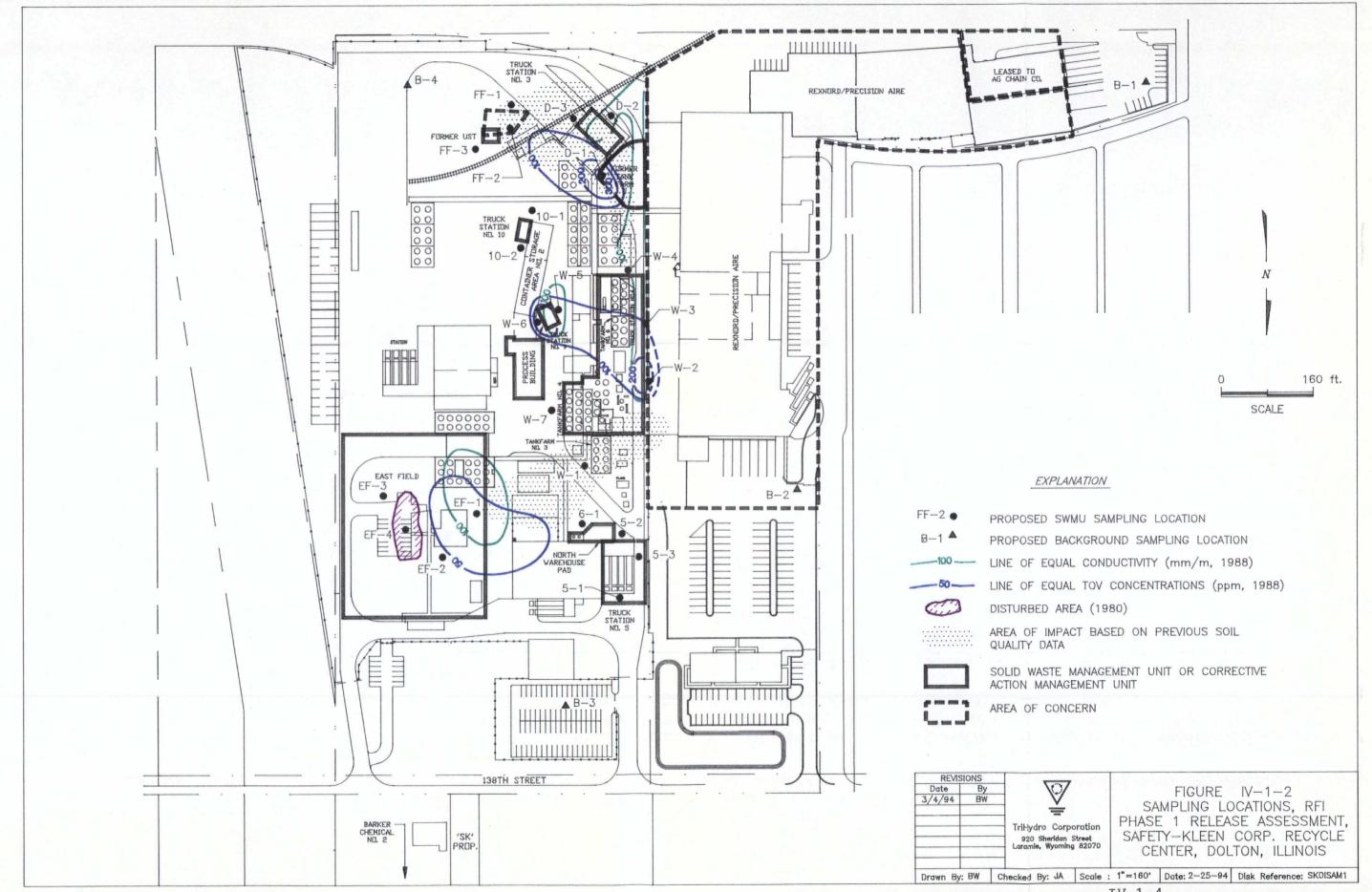
Background Locations

Soils and ground water not influenced by releases from SWMUs and other industrial activities will naturally contain certain "hazardous" constituents such as inorganic constituents. Data from background locations will be critical to identify the presence of elevated concentrations of inorganic constituents (and perhaps organic constituents) in soils due to a release. Samples from background locations will also be used as field blanks to evaluate compliance with quality assurance objectives. Quality assurance procedures are described in Part VII of the Workplan.

The background sampling locations are shown on Figure IV-1-2. The four background locations have been selected to satisfy the following criteria:

- 1. Located on Dolton facility property to minimize uncertainties about prior uses in the background areas.
- 2. Located at least 50 feet from any SWMUs listed in the Part B Permit as modified by IEPA and S-K.
- Located at least 50 feet from any current or past industrial activity, based on review of aerial photos.
- Spatial distribution across facility.
- 5. Same soil textures as encountered in SWMU soil samples (because natural inorganic constituent concentrations are a function in part of soil texture).

Background locations will be sampled first to minimize the potential for cross-contamination. If the onsite geologist determines that background soil samples are of a different soil texture than SWMU soil samples, he/she will collect samples from other background locations in order to satisfy the five background selection criteria listed above.



SWMU Locations

Twenty-three locations south of 138th Street will be sampled to identify and characterize releases to soils and shallow perched ground water. Criteria used to select sampling locations are:

- Within or adjacent to SWMUs. For areas with secondary containment (truck stations and West Tank Farm), sampling is planned next to the containment, because of access problems at several locations and concerns about damaging containment integrity at all locations.
- In areas of known impact, based on previous soil data (Figure II-2-8) and ground-water data (Figure II-3-6).
- 3. In areas of suspected impact, based on available information described in Part II.
- 4. Areas where releases are more likely, which include valve locations where wastes are transferred between tank and tanker.

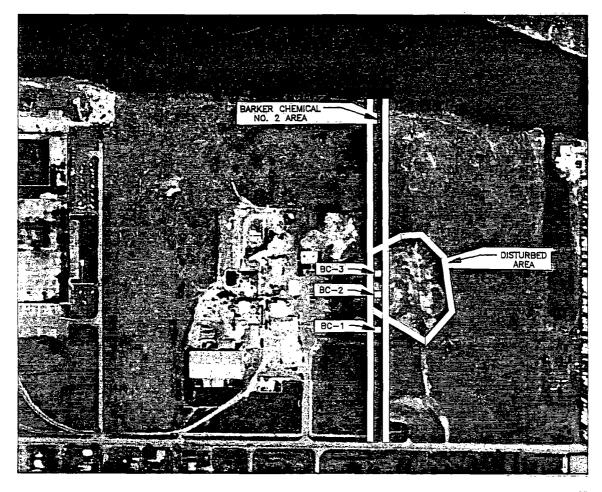
The 23 SWMU sampling locations south of 138th Street are shown on Figure IV-1-2 along with much of the rationale used for selecting the locations. As discussed below, three locations will also be investigated north of 138th Street in the Barker Chemical No. 2 Area.

Barker Chemical No. 2 Area

Three locations will be investigated in the area referred to as the Barker Chemical No. 2 Area. Interviews with S-K and former McKesson employees indicate that no waste management occurred on the property now owned by S-K. Therefore, the approach to this area is two-phased:

- 1. Determine if there is a SWMU on S-K property.
- 2. If there is, collect and chemically analyze soil samples.

Sampling locations are shown on Figure IV-1-3. Two locations will be within the possible area of disturbance on an April 1980 aerial photo and along the eastern boundary of S-K property. These two locations will be surveyed by an Illinois registered land surveyor to ensure that they are located according to the two criteria listed above.



1980

FIGURE IV-1-3 :SAMPLING LOCATIONS, BARKER CHEMICAL NO. 2
AREA, RFI PHASE I RELEASE ASSESSMENT,
SAFETY-KLEEN CORP. RECYCLE CENTER,
DOLTON, ILLINOIS

The third location will be outside the apparent area of disturbance on the April 1980 aerial photo. The purpose for sampling this location will be to define native soil conditions in order to determine whether the other two locations are sited in backfill (possibly indicative of SWMU) or native soil conditions. If the two locations appear to be located in backfill, S-K will collect soil samples from those locations for chemical analysis.

East Field

Four locations will be sampled in the East Field area:

- <u>EF-1</u>. Area of highest soil gas and conductivity readings in 1988 (Figures II-2-6 and II-2-7). Nearby Borehole 88-1 showed quantitative soil impacts (Figure II-2-8). Near area where 12 drums excavated during sewer line installation in 1991.
- <u>EF-2</u>. Adjacent to apparent area of drum excavation on 1980 aerial photo (Figure IV-1-3) and area of elevated soil gas readings (Figure II-2-6).
- <u>EF-3</u>. Adjacent to apparent area of drum excavation on 1980 aerial photo and near existing dolomite aquifer Well 88-7D, which indicated clean water when sampled in 1988.
- <u>EF-4</u>. Through apparent area of drum excavation in 1980 aerial photo.

Truck Station No. 5/North Warehouse Pad

The Truck Station No. 5/North Warehouse Pad area includes the former location of Truck Station No.6. Four locations will be sampled in this area:

- <u>5-1</u>. At entrance to truck station and near area of slightly elevated conductivity (Figure II-2-7).
- <u>5-2</u>. In former gravel area adjacent to truck station and also at entrance to former Truck Station No. 6.
- 5-3. Adjacent to low area of sloped containment pad in Truck Station No. 5.
- <u>6-1</u>. Near day tanks and containment sump, and in area of slightly elevated soil gas readings (Figure II-2-6).

West Tank Farm/Driveway to Facility

The West Tank Farm/Driveway area also includes Truck Station No. 4 and Truck Station No. 9. These areas are proximate and located in a part of the plant with relatively limited access. For those reasons, they have been combined into a single corrective action management unit (CAMU). Seven locations will be sampled in this CAMU:

- <u>W-1</u>. In area of qualitative impacts (Borehole 81-2 on Figure II-2-6).
- <u>W-2 and W-3</u>. Area of highest soil gas and conductivity readings (Figure II-2-6 and II-2-7). Near piping and valves of Truck Station No. 4.
- <u>W-4</u>. At entrance to Truck Station No. 4, in area of elevated soil gas and conductivity readings (Figures II-2-6 and II-2-7).
- <u>W-5 and W-6</u>. Near Truck Station No. 9 and in area of highest soil gas and conductivity readings (Figures II-2-6 and II-2-7).
- <u>W-7</u>. Accessible area adjacent to east side of Tank Farm No. 4. Location completes assessment of potential impacts around perimeter of West Tank Farm.

Former Tank Farm D/Truck Station No. 3

These two SWMUs are located adjacent to each other and have been combined into one CAMU. Three locations will be sampled in this CAMU:

- <u>D-1</u>. Within diked area of former Tank Farm D, at location of highest soil gas reading (Figure II-2-6), and at location of Borehole 88-5, where quantitative soil impacts were measured in 1988. Location is also near the north entrance to Truck Station No. 3.
- <u>D-2</u>. Adjacent to low area of sloped containment pad in Truck Station No. 3 and near area of elevated conductivity (Figure II-2-7).
- <u>D-3</u>. At south entrance to Truck Station No. 3 and between boreholes 88-4 (quantitative impact) and 83-10 (qualitative impact) (Figure II-2-8).

Former Southeast Tank Farm

Three locations will be sampled at the former aboveground tank farm and underground storage tank (UST) vault in the southeastern part of the plant:

- <u>FF-1</u>. Near Borehole 83-13 (qualitative impact) (Figure II-2-8) and within former tank farm.
- <u>FF-2</u>. Near Borehole 83-3 (qualitative impact) (Figure II-2-8) and within former tank farm. The vault structure has been filled but is still in place, based on field survey and communication with site personnel in February 1994; therefore, the sampling location is located adjacent to the east side of the vault.
- <u>FF-3</u>. Adjacent to the west side of the former UST vault and possible down-gradient direction, based on 1988 ground-water elevation data.

Truck Station 10

Two locations will be sampled adjacent to this truck station:

• <u>10-1 and 10-2</u>. In formerly gravelled area adjacent to the low point of the sloped containment pad at the truck station.

Rexnord/Precision Aire and TriStamp/Agri-Chain

Limited information is currently available regarding site conditions and historical operations at the Rexnord/Precision Aire and TriStamp/Agri-Chain facility. IEPA requested that the Phase I action for the Rexnord/Precision Aire and Tri-Stamp/Agri-Chain properties include an assessment of waste management activities. Pursuant to this IEPA request, S-K intends to perform an assessment of these properties, which will include:

- Review of current business activities waste generation and disposal.
- Review of historical business activities waste generation and management.
- Preparation of facility maps and photographs indicating areas of concern and SWMUs.

• Development of recommendations for further investigation, if necessary.

Following completion of this assessment, S-K will submit a report to IEPA which summarizes the procedures and results of the investigation. The report will be submitted within a time frame and schedule agreed to by S-K and IEPA. Therefore, S-K has not included provisions for sampling at the Rexnord/Precision Aire and TriStamp/Agri-Chain areas in this Phase I Workplan.

Soil Sampling Depths

Soil samples will be collected at 5-foot intervals from ground surface to 20 feet below ground surface at the three Barker Chemical No. 2 sampling locations. The purpose of this work will be to determine if there is a SWMU on S-K property. The onsite geologist will evaluate soil texture and field-screen the samples according to the procedures in Chapter IV-2. Based on this information, the geologist will determine if the SWMU is on S-K property, and subject to the soil sampling procedures described below. If there is evidence of a SWMU on S-K property, collection and chemical analysis of soil samples will be performed in the Barker Chemical No. 2 Area.

After determination whether a SWMU is on S-K property north of 138th Street, soil sampling will occur to identify and characterize releases from Dolton facility SWMUs. In addition, soil sampling and analysis will be conducted to define the vertical extent of impacts.

Soil samples for chemical analysis will be collected at about 2 feet and 20 feet below ground surface. Data from the shallow depth will be used to identify soil impacts, and data from the greater depth will be used to define extent. The maximum depth of impacts detected during previous investigations is less than 10 feet, because of the low permeability clay underlying the site. The deep sample location (± 20 ft-bgs) was selected to be below the maximum depth of the bottom of the perched water zone (15 feet). The deep sample at each location will be field screened, and a deeper sample will be collected if necessary to define the vertical extent of impacts.

During the sampling program, the onsite geologist will evaluate the range of soil textures from the background locations to ensure that they match the range of soil textures encountered in soil samples underlying the SWMUs. If they do not match, additional background intervals and/or locations may be sampled to ensure a match. The importance of matching

soil textures is that inorganic concentrations are naturally a function of soil texture; clays tend to have higher inorganic concentrations than sands and gravels. Therefore, samples from background locations should have the same soil textures as those from SWMU locations.

Ground-Water Sampling Depths

A ground-water level will be measured and a water sample collected at all background and SWMU locations south of 138th Street where ground water is present in the perched zone (historically 1 to 5 feet below ground surface). A ground-water sample will be collected from the perched zone at a depth of approximately 5 to 10 feet below ground surface. At the Barker Chemical No. 2 Area north of 138th, ground-water levels will be measured and water samples collected only if perched ground water is present and if the SWMU is determined to be on S-K property. The procedures to measure fluid levels and collect ground-water samples are described in the next chapter.

CHAPTER IV-2

FIELD PROCEDURES

Safety-Kleen Corp. intends to collect eight background soil samples, 46 to 50 solid waste management unit (SWMU) soil samples, five blind duplicate soil samples, up to 29 ground-water samples, and three blind duplicate ground-water samples during the Phase I RFI Release Assessment. Procedures to collect the soil and ground-water samples are described in this section. The field procedures include:

- Pre-field coordination and preparation activities
- Equipment decontamination
- Soil sample collection
- Field screening
- Ground-water sample collection
- Field documentation
- Chain-of-custody control
- Post-field activities.

Pre-Field Activities

Several activities will be conducted prior to departure for the project site. A project team is assigned and the members will begin coordinating the sample collection event with the Dolton facility, the laboratory, and regulatory agencies. Field equipment will be checked and organized. Pertinent health and safety criteria will be reviewed along with the Health and Safety Plan (Part V). Site access will be checked with John Valerius (Dolton facility site representative), and provisions will be made to pack the necessary equipment for delivery to the project site.

Project Team

The sampling project team will consist of the project manager, the site manager, and field team (if necessary). The qualifications and responsibilities of individual project team personnel with respect to the field activities are:

1. Project Manager

- a. Schedule the sampling event;
- b. Assign qualified personnel to the field team;
- c. Monitor sampling activities to ensure compliance with the Workplan (calls from field personnel, etc.); and
- d. Review field data and chain-of-custody/sampleanalysis-request records to ensure compliance with the Workplan.

2. Site Manager

- a. Knowledgeable in sampling techniques;
- Knowledgeable in operation and maintenance of instruments;
- c. Knowledgeable about project health and safety plan and procedures; and
- d. Responsible for:
 - i. Ensuring compliance with the Workplan;
 - ii. Preparations for sampling event;
 - iii. Ensuring the proper equipment is available and operating;
 - iv. Assigning field team members' responsibilities and overall supervision (if necessary);
 - v. Onsite client contacts;
 - vi. Logging field data;
 - vii. Shipping or transporting samples;
 - viii.Chain-of-custody/sample-analysis-request
 forms; and
 - ix. Laboratory contact.

3. Field Team Members

a. Knowledgeable in sampling techniques;

- b. Knowledgeable about the project health and safety plan;
- c. Able to calibrate and operate instruments properly;
- d. Log data acquired during sampling; and
- e. Assist the sampling supervisor as necessary.

Preparation

The project site manager will review the RFI Phase I Workplan and related correspondence to determine if any plans or reports need to be brought to the site during monitoring, if any changes have been made to the sampling and analytical procedures, and if any groups need to be contacted about sampling observation or split sampling. At a minimum, the Illinois Environmental Protection Agency (Eric Minder) will be contacted seven to 14 days prior to sampling about the sampling schedule.

Dolton facility (John Valerius or designate) will be contacted to confirm the expected arrival time at the site and expected departure time. The laboratory will be informed when sample coolers are expected to arrive and the method and location of arrival.

All sampling and monitoring equipment will be inspected prior to departure to ensure that it is in proper working order. The necessary health and safety monitoring equipment is described in detail in the Health and Safety Plan (Part V).

Equipment Inventory

The following equipment and supplies may be used for soil sampling:

o <u>Soil Sampling</u>

- Concrete cutter or electric rotary hammer drill and bits
- Brass rings, teflon sheets, and plastic caps
- Glass jars (2 or 4 ounce and 32 ounce) with teflon-lined lids
- Photoionization detector
- Soil sample extruder

- Bentonite
- Asphalt and concrete patch
- Marking pen, labels
- Hexane
- Non-phosphate detergent and scrub brush
- Decontamination containers and brushes ash, rinse, rinse)
- Distilled or deionized water
- Protective gloves
- Plastic sheeting
- Coolers with ice
- Plastic bags for sample containers and ice

o <u>Ground-Water Sampling</u>

- Manometer for fluid levels
- Sampling pump
- Tarps
- Filtration unit, nitrogen tank, regulator, filters
- Disposal gloves
- Buckets for water disposal
- Sample bottles with preservatives
- Coolers with ice
- Distilled water

o <u>Health and Safety</u>

- Photoionization detector
- Combustible gas meter
- Benzene detector tubes
- Respirators with organic cartridges

- Dust protection masks
- Hard hats and safety glasses
- Tyvek suits
- Appropriate shoes or boots

Safety Procedures

The project site manager will review the Health and Safety Plan (Part V), and make copies of the Plan available to all field team members. The project site manager will inform all field team members immediately before monitoring of the kinds of contaminants found or expected to be found at the site, and the possible hazards.

The project site manager will be responsible for bringing the appropriate safety equipment to the sampling site. All field team members will be knowledgeable in the operation of necessary safety equipment. Each field team member is responsible for 1) bringing appropriate safety equipment to each sampling site during monitoring, 2) making the equipment immediately available for use, 3) recognizing safety or health hazards, and 4) undertaking the appropriate safety precautions.

The field team will consist of a minimum of two people at or in the general vicinity of the sampling site. If a field team member will be out of visual contact with the other member(s) of the sampling party, he or she will inform the project site manager of his/her location before heading to the sampling site.

Access Control

Protective measures will be employed for limiting access to the sampling sites during sampling. The project site manager (or designate) will be present at each sampling site during the entire sampling period. The project site manager will be responsible for controlling any activities that might influence the integrity of the soil collection procedures.

Sample Collection Procedures

The project site manager will implement the monitoring required under the Health and Safety Plan (Part V of the Workplan). Soil and ground-water sampling devices are

described in Appendix IV-A. Sampling procedures are described below.

Soil Sampling

Concrete or asphalt will be removed (if appropriate), and soil sample collection will commence with GeoProbe or equivalent equipment using the following procedure:

- A new or decontaminated brass liner assembly will be placed into a stainless steel sampler (called a Kansas sampler). Samplers are 1 to 2 feet in length.
- 2. The sample (decontaminated) will be attached to drive rods which are 3 feet in length.
- 3. The sampling tool will be hydraulically advanced to the sampling depth.
- 4. The tool will be opened and driven 1 to 2 feet to fill the liner with a soil sample.
- 5. The tool will be hydraulically withdrawn to the surface.
- 6. The brass liner will be broken manually into sections by a field team member wearing sterile gloves.
- 7. The uppermost section will be discarded, because it may contain borehole slough.
- 8. Two sections will be capped with Teflon sheets and slip-on plastic caps, marked with a sample number, and placed in an opaque cooler on ice immediately upon collection. Care will be taken to minimize headspace during this procedure. Sample collection will adhere to IEPA "Soil Volatile Sampling Procedures" (Appendix IV-B), except that Teflon sheeting rather than aluminum foil will be used to seal the brass rings.
- 8. The soil in the remaining section will be subjected to field screening procedures described in a subsequent section.

One soil sample, consisting of three to four brass rings (or more, if necessary), or two to three 2- or 4-ounce glass jars if soil lacks sufficient cohesion, will be collected from each sampling interval. In addition, blind duplicate samples will be collected from five of the SWMU sites for quality assurance

analyses. The brass rings or glass jars will be used for analysis of volatile organic compounds, semi-volatile organic compounds, and eight inorganic constituents.

Ground-Water Sampling

Phase I ground-water sampling will be conducted using a GEO Environmental ATV/Geoprobe hydraulic sampling rig or equivalent. In this method, an expendable point will be driven into the ground water within the perched zone, and the probe rods will be extracted to expose a dedicated perforated 3/8-inch teflon tube. The depth to ground water in the tube will be measured with a manometer. The elevation of the top of the tubing will be surveyed to the nearest 0.1 foot by a licensed land surveyor to convert depth to water to a ground-water elevation in feet above mean sea level.

Ground water will be sampled using a peristaltic or inertia pump. Three volumes of water column in the tubing will be purged, and the required sample taken. Ground-water samples will be collected in order of decreasing volatility: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and inorganic constituents. Water to be analyzed for VOCs will be pumped with minimal agitation into a 40-milliliter VOA glass bottle, and all headspace will be eliminated. Water to be analyzed for SVOCs will be pumped with minimal agitation into liter glass bottles filled as completely as possible. Water to be analyzed for inorganic constituents will be pumped into the filtration chamber, and then filtered with pressurized nitrogen into a 500-milliliter plastic bottle containing preservatives.

Hole Patching

Soil and concrete will be stockpiled with other demolition debris from the facility, and hauled to a suitable offsite disposal facility. Sampling locations will be plugged by pouring bentonite granules down the hole and hydrating in approximately 1- to 2-foot lifts to the surface. The surface will be repaired to matching grade. A concrete patch will be placed over the sampling location in areas where concrete is present and asphalt patch will be placed over the sampling location in areas where asphalt is present.

Field Screening

One aliquot of soil from each sampling interval will be screened in the field to evaluate the nature and degree of

impact. Field screening includes physical descriptions by the onsite geologist and measurements of total organic vapors (TOV) with the photoionization detector (PID).

Soil from each sampling depth will be extracted from one brass liner into a ziplock bag and brought to room temperature. The PID probe will be inserted into the bag, and the highest TOV reading measured by the PID will be recorded. A Thermo Environmental Model 580B PID equipped with a 10.0 eV lamp (or equivalent) will be used during field screening. The PID will be calibrated with a 100 parts per million (ppm) isobutylene standard at the beginning of each day and periodically during the day. The soil will also be described by the onsite geologist in terms of texture (per ASTM Method D-2488), moisture content, staining, and any other pertinent information.

Capped samples from each interval will be held in a cooler or refrigerated at the site until it is determined which samples will be sent to the laboratory. The objectives of the soil sampling program are to define the nature, degree, and vertical extent of soil quality degradation in the unsaturated zone. To achieve the soil sampling program objectives, Safety-Kleen will submit for laboratory analysis the following soil samples from above and below the shallow perched saturated zone of each borehole:

- 1. A sample from immediately below the ground surface (1-3 feet) to define nature and degree.
- 2. A sample in the clay aquitard at a depth of ±20 feet below ground surface to define vertical extent.
- 3. If field screening indicates possible impact at the deep sample interval (based on field screening), a second sample may be submitted from the interval below the possible impact.

The laboratory samples will be packaged, placed on ice in a cooler (maintained at about 4°C), and delivered within 24 hours of sampling to the S-K Environmental Laboratory for analysis. Soil samples will not be composited. All samples will be accompanied by completed chain-of-custody/sample-analysis-request forms.

Decontamination Procedures

Brass rings will be decontaminated prior to sampling, either in the laboratory or in the field. Brass rings will be

cleaned according to the procedures described below. Glass containers will be pre-cleaned and supplied by an independent supplier. The sampling devices will be decontaminated in the field immediately prior to and after sampling each site. Sampling equipment will be disassembled into component parts prior to washing.

Field decontamination will include washing the sampling devices and brass rings and caps in a warm non-phosphate detergent solution, rinsing the devices and containers with tap water, and then rinsing the devices with distilled or deionized water. In addition, the detergent solution and rinsewaters will be pumped through the ground-water sampling pump. Sampling devices and containers will be dried before use by air drying or with clean paper towels. If a hydrocarbon sheen becomes present on the rinse water during decontamination, the sampling devices and/or containers will be decontaminated again with hexane, fresh wash and rinse water. All washing fluids and rinse water will be containerized at the Dolton facility for proper processing by S-K.

The decontaminated sampling devices and brass rings will be stored in clean containers, plastic bags or ziplock-type bags until use. The brass rings and sample containers may be stored until use in coolers.

Field Documentation

Field observations are critical to the verification and interpretation of the laboratory data. Field observations during soil sampling will be recorded in the field log book. The following information will be recorded in the field notebook where appropriate:

- Date and name of observer
- Names and affiliations of sampling team members
- Names and affiliations of others present at the sampling sites
- Weather conditions
- Sampling location (with measured distances) and time of sampling
- Health and safety data on total organic vapors and combustible gas concentrations.
- Health and safety measures implemented (e.g., respirators)

- Sampling site condition upon arrival (concrete cover, standing water, erosion, etc.)
- Soil characteristics and texture
- Depth to ground water
- Volume purged from ground-water sampling device, and response of fluid levels to pumping
- Soil and ground-water observations, including discoloration, hydrocarbon sheens, moisture content, etc.
- Deviations from or clarifications of sampling procedures in the Workplan
- Miscellaneous conditions which the sampling team finds noteworthy

The project site manager will review and sign the field notes after each day of sampling.

Photographs will be taken of every sampling site. Photographs will also be taken of sampling procedures at one location.

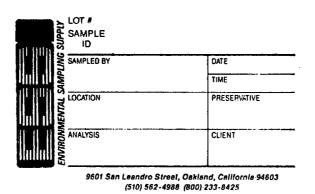
Chain-of-Custody Control

A record of sample possession from "cradle to grave" will be kept in Dolton facility files. The sample tracking starts with the sample container label. Information provided on the sample label will be complete and accurate. A completed chain-of-custody/sample-analysis-request form will accompany each shipment of sample containers from project site to the laboratory. Finally, a custody seal will be placed on the shipping container to minimize the possibility of sample tampering.

Sample Label

Each sample container will be identified with a label. The sample label will be the one shown on Figure IV-2-1 or equivalent. The information which will appear on the sample container label includes:

- 1. Sample identification number
- 2. Place of collection (or project number)



- 3. Date and time of collection
- 4. Personnel collecting the sample
- 5. Preservative (none in the case of soil samples)
- 6. Analyses requested
- 7. Any special information, such as an estimate of the level of contamination

Chain-of-Custody Forms

All samples will be accompanied by completed chain-of-custody/sample-analysis-request forms (Figure IV-2-2). The project site manager will keep a copy of this completed form, and another copy will be kept at the Dolton facility.

Custody Seal

If and when the samples leave custody of the sampling team, the shipping container will be sealed with a custody seal to ensure that the samples have not been disturbed during transportation to the laboratory. The laboratory personnel receiving the coolers will note the condition of the seal and the sample containers within on the chain-of-custody/sample-analysis-request form.

Post-Field Activities

The project site manager and field team members are responsible for several activities after the samples have been shipped to the laboratory. The post-field responsibilities include laboratory contact, record filing, and equipment checks.

Continued Supervision

The project site manager will call the laboratory on the day the samples are due to arrive at the laboratory to ensure that they have in fact arrived. The project site manager will call the laboratory periodically to make sure that samples are being analyzed within the following holding times:

Volatile Organic Compounds

14 days

Semi-Volatile Organic Compounds

14 days until extraction, 40 days after extraction

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Inorganic Constituents (except Hercury)

6 months

Mercury

28 days

Records

The project site manager will collect all pertinent field data (i.e., chain-of-custody, copies of field logbook records, etc.) and file it in the client job file immediately after returning from the field. Proper and efficient management of the sampling records will aid in reviewing and evaluating the laboratory analytical data. The project site manager will also ensure laboratory data are placed in the project file.

Equipment

Any equipment problems noted during sampling and not corrected in the field will be corrected upon return to the office. Broken or contaminated equipment will not be returned to storage for future use.

CHAPTER IV-3

LABORATORY ANALYSIS

Samples will be submitted to S-K Environmental Laboratory for chemical analysis. The laboratory is located in Elk Grove Village, Illinois. The S-K Environmental Laboratory is certified and qualified to perform the necessary analyses, as described in Part III.

Samples To Be Analyzed

The samples to be analyzed are shown in Table IV-3-1. The procedures to select soil samples for laboratory analysis are described in the previous chapter under "Field Screening." As shown in Table IV-3-1, duplicate soil and water samples, trip blanks, and equipment blanks will be collected and submitted to the laboratory for quality assurance. As discussed in the Quality Assurance Project Plan (Part VII of the Workplan), additional quality assurance samples will be prepared in the laboratory for chemical analysis quality control.

Constituent List

The samples will be analyzed for the 107 constituents described in Table IV-3-2. The full constituent list is presented in Appendix IV-C. The constituent list consists of eight inorganic constituents, 37 volatile organic compounds (VOCs), and 62 semi-volatile organic compounds (SVOCs). The constituent list includes:

- All hazardous constituents detected in soils and ground water during previous sampling events at the Dolton facility.
- All hazardous constituents and hazardous waste constituents detected in wastes managed at the Dolton facility (Appendix IV-D).
- Other VOCs and SVOCs commonly analyzed by the S-K Environmental Laboratory using Methods 8240 and 8270 (gas chromatography/mass spectroscopy), respectively.

Table IV-3-1. Sampling and Analysis Matrix, RFI Phase I Workplan, Dolton Recycle Center.

				Investigati	ve Samples		Field Qua	lity Contro	Samples
Sample Matrix	Field Parameters	Lab Parameters	Туре	No. of Sites	No. per Site	Total	Trip Blanks	Equipment Blanks	Field Duplicates
Soil	Physical Descriptions						<u> </u>		
	Total Organic Vapors		BG SWMU	4 23-25	2 2	8 46-50	0	0	5
		Volatile Organic Compounds Semi-Volatile Organic Compounds Inorganic Compounds, Total	BG SWMU	4 23-25	2 2	8 46-50	0	0	5
Ground Water	Water Levels		BG SWMU	4 23-25	1 1	4 23-25	0	0	3
	Physical Descriptions		.						
		Volatile Organic Compounds Semi-Volatile Organic Compounds Inorganic Compounds, Dissolved	BG SWMU	4 23-25	1 1	4 23-25	3	3	3

<u>Notes</u>:

- 1. The number of sites depends on whether a SWMU exists in the Barker Chemical No. 2 Area on S-K property, and thus is subject to this investigation.
- 2. Laboratory control samples are described in Appendix VII-A.
- 3. BG means background. SWMU means solid waste management unit.

Table IV-3-2. Constituent List, RFI Phase I Release Assessment, Dolton Recycle Center.

Constituent	Method (from SW-846)	Method Detection Limit (mg/kg)
Inorganics		
Arsenic	7060	1.25
Barium	6010	2.0
Cadmium	6010	2.0
Chromium	6010	4.0
Lead	6010	11.0
Mercury	7471	0.04
Selenium	7740	0.9
Silver	6010	3.0
Organics*		
Volatile Organic Compounds (37)	8240	0.005-0.100
Semi-Volatile Organic Compounds (62)	8270	0.33-3.3

^{*} A complete list of organic compounds and method detection limits for individual compounds are presented in Appendix IV-C.

Analytical Methods

All analyses will be conducted for the total concentration of each constituent, except that inorganic constituents in ground-water samples will be analyzed for the dissolved fraction because of the high silt content expected in the samples. Analytical methods are referenced in Table IV-3-2, and contained in EPA's SW-846.

The laboratory will attempt through these standardized analytical methods to achieve the method detection limits (MDLs) listed in Table IV-3-2 and Appendix IV-C. However, MDLs are highly matrix dependent. Because Phase I focuses on the most impacted soils (and ground water), matrix interferences are anticipated. EPA's SW-846 lists modified MDLs for certain methods given matrix interferences (see Table IV-3-3). These modified MDLs will be used to determine completeness (see quality assurance procedures in Part VII of the Workplan).

Holding Times

The laboratory will be instructed to meet the following holding times:

Constituent	Maximum Holding Time
Metals	6 months, excluding mercury (28 days)
VOCs	14 days
SVOCs	14 days until extraction, 40 days after extraction

The laboratory will be requested to provide a laboratory data report within 45 days of sample receipt.

Ouality Assurance Procedures

Background samples, blind duplicate samples, aqueous trip and equipment blanks, and laboratory-prepared quality assurance samples will be analyzed by the laboratory during the Phase I Release Assessment to evaluate quality control. The quality assurance procedures are described in detail in Part VII of this Workplan.

Table IV-3-3. Revised Method Detection Limits Due to Matrix Interferences, RFI Phase I Release Assessment, Dolton Recycle Center.

Analytical Method	Matrix	Method Detection Limits
8240 (VOCs)	Clean and low-level soils	See MDLs in Appendix IV-C
	High-level soils	Multiply MDLs by 125
	Clean and low-level ground water	See MDLs in Appendix IV-C
	Medium-level and high-level ground water	Multiply MDLs by 50
8270 (SVOCs)	Clean and low-level soils	See MDLs in Appendix IV-C
	Medium-level and high-level soils by sonication	Multiply MDLs by 7.5
	Ground water	See MDLs in Appendix IV-C

Note: These revised method detection limits are based on information in SW-846.

CHAPTER IV-4

REFERENCES

U.S. Environmental Protection Agency, 1987. Test Methods for Evaluating Solid Waste, Revision 1 (SW-846).

APPENDIX IV-A
SAMPLING EQUIPMENT AND PROCEDURES

GEO ENVIRONMENTAL SERVICES, INC. (EASI) GROUND WATER SAMPLING SYSTEM

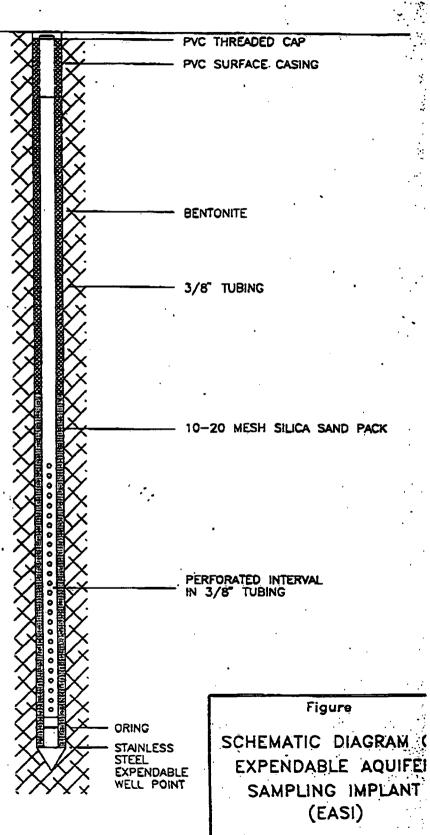
GROUND SURFACE

EXPENDABLE AQUIFER SAMPLING IMPLANT (EASI) GEO Environmental has developed o ground water system which allows for real—time sampling and temporary monitoring using the ATV/Geoprobe hydraulic sampling rig.

Standard operating procedures: The ATV/Geoprobe drives an expendable point into the ground water. At this point the probe rods are retracted exposing 3/8 inch tubing. This tubing can be perforated just like you would screen a well, 5 feet or 10 feet for example. Ground water con then be sampled with a peristaltic or incrtic pump. If purgeable water is not present, a temporary miniature sampling implant can be completed just like a permanent manitor well would be. The EASI implant can then be developed by ourging three volumes of the tubing. Once the static water level is established, depth to ground water can be determined.

EASI CAPABILITY

- Ground water sampling to 40 feet.
 Measure ground water levels to 0.1".
 Completed implant cost of \$20.
- Truly expendable and temporary. No soil cuttings generated.
- ideal for clay lithologies where
- purgeable ground water is hard to find.
- Fast, 10-20 implants in 8 hours.



GEO Environmental Services



GEO ENVIRONMENTAL SOIL SAMPLING PROCEDURES

EQUIPMENT USED: -SCORPION ATV HYDRAULIC PROBING RIG

-VIPER 1 TON HYDRAULIC PROBING RIG

-ONE FOOT OR TWO FOOT KANSAS LARGE BORE SAMPLER

TO

-TWO FOOT SPLIT SPOON PROBE SAMPLER

-HYDRAULIC PROBE RODS

PROCEDURES:

- The entire borehole can be continuously cored or just interval cored by using either the large bore sampler or the split spoon sampler. The sampler is attached to one or three foot drive rods and driven to depth where it is opened.
- 2. The sampler is opened by using a special rod that is driven down the inside diameter of the probe rods. This rod turns a pin loose from the sampler releasing the piston drive head. The sampler is then filled by simply hammering it into the ground coring the soil into the body of the sampler.
- 3. The sampler is then brought to the surface where the soil is removed by either extruding a clear liner from the sampler or by breaking open the split spoon.
- 4. The equipment is then decontaminated by using a steam cleaner or an EPA triple rinse. Decontamination procedures are repeated before and after each sample is taken.

TO



GEO Environmental utilizes a Large Bore Sampler during soil sampling procedures. This apparatus is designed to recover sample cores a full 24 inches long X 1 inch in diameter. With its piston stop pin release mechanism, this sampler allows the technician to extract a highly representative sample from the bore hole. As standard practice, the sampler employs a polybutyrate liner which allows the sample to be removed with minimal effort and free of contamination.

** GEO Environmental will utilize, by prior arrangement, special liners composed of teflon, brass, or stainless steel.

APPENDIX IV-B IEPA SOIL VOLATILES SAMPLING PROCEDURES

ATTACHMENT 7

Soil Volatile Sampling Procedures

Procedure:

- A. PREPARATION AND DECONTAMINATION OF SOIL SAMPLER (i.e. STAINLESS STEEL, BRASS, BRONZE, COPPER, etc.). An example of these samplers would be a shelby tube, split-barrel sampler with metal tube inserts or california sampler. These are only examples there maybe more types available. Also, the sample tube must be at least six inches long.
 - *1. Wash tubing or sampler with hot water and a nonfoaming detergent.
 - 2. Rinse with hot water.
 - *3. Rinse with a solvent, such as hexane or acetone.
 - 4. Rinse with very hot water to drive off solvent.
 - 5. Rinse with deionized distilled water.
 - 6. Air Dry
 - 7. Store the sampler in aluminum foil until ready for use.*Consult the laboratory for specific recommendations.

B. SOIL SAMPLING FOR VOLATILE ORGANICS

- 1. Using a properly decontaminated sampler (refer to preparation and decontamination instructions), push or drive the sampler to obtain a representative soil sample.
- 2. DO NOT remove sample from sample tube in the field. The laboratory should remove the sample from the sampling tube.
- 3. Immediately add clay or other cohesive material (i.e. wetted bentonite) to the ends of the sample to eliminate head space, if necessary.
- 4. Cover both ends of the sampler with aluminum foil. If possible, cover the aluminum foil with a cap.
- 5. Put the sample in storage at 4 degrees centigrade immediately.
- 6. Transport the samples to the laboratory as soon as possible. Most laboratories require delivery within 24 hours of sampling.

NOTE:

Soil samples which will be tested for volatile organic constituents <u>cannot</u> be composited because of the volatilization which would result from any compositing method.

APPENDIX IV-C

PROJECT CONSTITUENT LIST DOLTON RECYCLE CENTER

Table IV-C-1. Inorganic Constituents, RFI Phase I, Dolton Recycle Center.

Constituent	Method	Method Detection Limit (mg/kg)
Arsenic	SW-846 7060	1.25
Barium	SW-846 6010	2.0
Cadmium	SW-846 6010	2.0
Chromium	SW-846 6010	4.0
Lead	SW-846 6010	11.0
Mercury	SW-846 7471	0.04
Selenium	SW-846 7740	0.9
Silver	SW-846 6010	3.0

Table IV-C-2. Volatile Organic Compounds, RFI Phase I, Dolton Recycle Center.

Constituent	Method	Method Detection Limit (mg/kg)
Acetone	SW-846 824	0.100
Benzene	SW-846 824	
Bromodichloromethane	SW-846 824	
Bromoform		
	SW-846 8240	
Bromomethane	SW-846 824	
Carbon disulfide	SW-846 8240	
Carbon tetrachloride	SW-846 8240	
Chlorobenzene	SW-846 8240	
Chloroethane	SW-846 824	
Chloroform	SW-846 824	
Chloromethane	SW-846 824	
Dibromochloromethane	SW-846 824	
1,1-Dichloroethane	SW-846 824	
1,2-Dichloroethane	SW-846 824	0.005
1,1-Dichloroethylene cis-1,2-Dichloro-	SW-846 824	0.005
ethylene	SW-846 824	0.005
trans-1,2-Dichloro-		
ethylene	SW-846 824	0.005
1,2-Dichloropropane	SW-846 824	
cis-1,3-Dichloro-	5 010 011	
propene	SW-846 824	0.005
trans-1,3-Dichloro-	5, 010 021	3.003
propene	SW-846 824	0.005
Ethylbenzene	SW-846 824	
2-Hexanone	SW-846 8240	
Methylene chloride	SW-846 824	
	SW-846 8240	
Methyl ethyl ketone		
4-Methyl-2-pentanone	SW-846 8240	
Styrene	SW-846 824	0.005
1,1,2,2-Tetrachloro-	OW 046 004	0 005
ethane	SW-846 8240	
Tetrachloroethylene	SW-846 8240	
Toluene	SW-846 824	0.005
1,1,1-Trichloro	GTT 0.4.5 0.0.4.	
ethane	SW-846 824	0.005
1,1,2-Trichloro-		
ethane	SW-846 824	
Trichloroethylene	SW-846 824	0.005
Trichlorofluoro-		_
methane	SW-846 824	0.010
Trichlorotri-		
fluoroethane	SW-846 824	
Vinyl Acetate	SW-846 824	
Vinyl Chloride	SW-846 824	
Xylene (total)	SW-846 824	0.005

Table IV-C-3. Semi-Volatile Organic Compounds, RFI Phase I, Dolton Recycle Center.

Constituent	Method	Method Detection Limit (mg/kg)
- 1.1		
Acenaphthene	SW-846 8270	0.660
Acenaphthylene	SW-846 8270	0.660
Anthracene	SW-846 8270	0.660
Benzo(a)anthracene	SW-846 8270	0.660
Benzo(b)fluoranthene	SW-846 8270	0.660
Benzo(k)fluoranthene	SW-846 8270	0.660
Benzo(ghi)perylene	SW-846 8270	0.660
Benzo(a)pyrene	SW-846 8270	0.660
Benzyl alcohol	SW-846 8270	1.300
Bis(2-chloroethoxy)		
methane	SW-846 8270	0.660
Bis(2-chloroethyl)		
ether	SW-846 8270	0.660
Bis(2-ethylhexyl)		3.333
phthalate	SW-846 8270	0.660
4-Bromophenyl phenyl	511 010 0270	0.000
ether	SW-846 8270	0.660
Butyl benzyl phthalate	SW-846 8270	0.660
p-Chloroaniline	SW-846 8270	1.300
p-Chloro-m-cresol	SW-846 8270	0.660
2-Chloronaphthalene	SW-846 8270	0.660
2-Chlorophenol	SW-846 8270	0.660
4-Chlorophenyl	SW-046 02/0	0.660
phenyl ether	SW-846 8270	0.660
Chrysene	SW-846 8270	0.660
m-cresol	SW-846 8270	
		0.660
o-cresol	SW-846 8270	0.660
p-cresol	SW-846 8270	0.330
Dibenz (a, h) anthracene	SW-846 8270	0.660
Dibenzofuran	SW-846 8270	0.660
Di-n-butyl phthalate	SW-846 8270	0.660
o-Dichlorobenzene	SW-846 8270	0.660
m-Dichlorobenzene	SW-846 8270	0.660
p-Dichlorobenzene	SW-846 8270	0.660
3,3'-Dichloro-		
benzidine	SW-846 8270	1.300
2,4-Dichlorophenol	SW-846 8270	0.660
Diethyl phthalate	SW-846 8270	0.660
2,4-Dimethylphenol	SW-846 8270	0.660
Dimethyl phthalate	SW-846 8270	0.660
2,4-Dinitrophenol	SW-846 8270	3.300
2,4-Dinitrotoluene	SW-846 8270	0.660
2,6-Dinitrotoluene	SW-846 8270	0.660
Di-n-octyl phthalate	SW-846 8270	0.660
Fluoranthene	SW-846 8270	0.660

Table IV-C-3. Semi-Volatile Organic Compounds, RFÍ Phase I, Dolton Recycle Center (continued).

Constituent	Method	Method Detection Limit (mg/kg)
Fluorene	SW-846 8270	0.660
Hexachlorobenzene	SW-846 8270	0.660
Hexachlorobutadiene	SW-846 8270	0.660
Hexachlorocyclo-	OW 046 0070	
pentadiene	SW-846 8270	+ -
Hexachloroethane	SW-846 8270	0.660
Indeno(1,2,3-c,d)	CIT 046 0270	0.660
pyrene	SW-846 8270	0.660
Isophorone 2-Methyl-	SW-846 8270	0.660
	SW-846 8270	1 300
4,6-dinitrophenol	-	1.300
2-Methylnaphthalene	SW-846 8270	0.660
Naphthalene	SW-846 8270	0.660
o-Nitroaniline	SW-846 8270	3.300
m-Nitroaniline	SW-846 8270	3.300
p-Nitroaniline	SW-846 8270	ND
Nitrobenzene	SW-846 8270	0.660
o-Nitrophenol	SW-846 8270	0.660
p-Nitrophenol	SW-846 8270	3.300
Pentachlorophenol	SW-846 8270	3.300
Phenanthrene	SW-846 8270	0.660
Phenol	SW-846 8270	0.660
Pyrene	SW-846 8270	0.660
1,2,4-Trichlorobenzene	SW-846 8270	0.660
2,4,5-Trichlorophenol	SW-846 8270	0.660
2,4,6-Trichlorophenol	SW-846 8270	0.660

ND = Not Determined

APPENDIX IV-D

HAZARDOUS CONSTITUENTS POTENTIALLY MANAGED AT THE DOLTON RECYCLE CENTER

Parts Washer Solvent Wastes

Physical Properties and TCLP Analysis, ppm

Parameter	Reg. Limit	# Samp	Avg	Min	Max
ρH	<2 or >10	7	6.6	5.5	8.0
SG	na	7	0.79	0.78	0.80
FP	< 100	7	112	78	151
As	5	7	0.00	0.00	0.00
8a	100	7	0.47	0.00	1.20
Cd	1	7	0.05	0.00	0.07
Cr	5	7	0.00	0.00	0.02
Pb	5	7	0.90	0.47	1.60
Hg	0.2	7	0.00	0.00	0.00
Se	1	7	0.00	0.00	0.00
Ag.	5	7	0.00	0.00 -	0.00
cresol	200	7	2.70	0.00	9.00
2.4-DNT	0.13	7	0.63	0.00	4.40
CI6-benz	0.13	7	0.00	0.00	0.00
C16-13-but	0.5	7	0.00	0.00	0.00
CI6-eth	3	7	0.00	0.00	0.00
nitrobenz	2	7	0.00	0.00	0.00
CI5-phenol	100	7	0.00	0.00	0.00
pyridine	5	7	0.00	0.00	0.00
2.4.5-TCP	400	7	0.00	0.00	0.00
2.4.6-TCP	2	7	0.00	0.00	0.00
benzene	0.5	7	0.04	0.00	0.15
CC14	0.5	7	0.00	0.00	0.00
Cibenz	100	7	0.00	0.00	0.00
CHCI3	6	7	0.06	0.00	0.41
1.4-DCIB	7.5	7	0.05	0.00	0.38
1.2-DCA	0.5	7	0.00	0.00	0.00
1.1-DCE	0.7	7	0.00	0.00	0.00
MEK	200	7	0.74	0.00	3.90
PCE	0.7	7	0.65	0.00	2.80
TCE	0.5	7	0.07	0.00	0.49
VChioride	0.2	7	0.00	0.00	0.00

Less than values are treated as zeros in the statistical analysis Greater than values are treated as the value in the statistical analysis

Parts Washer Solvent Wastes TCLP Organics And EPA 8240/8270 Analyses, ppm

		Parameter	cresol	2.4-DNT	CI6-benz	CI6-13-but	CI6-eth	nitrabenz	CI5-phenol	pyridine	2.4.5-TCP	2,4.6-1CP	
		Reg. Limit	200	0.13	0.13	05	3	2	100	5	400	2	
LAB	SITE	ANALYSIS								na			
M	a	TCLP	•	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.17	< 0.17	< 0.033	< 0 033	
M	CL	8240/8270	<1	<1	< 1	< 1	< 1	<1	< 5	na	< 1	<1	
W	DE	TCLP	3	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0 17	< 0.17	< 0.033	< 0 033	
W	DE	8240/8270	280	< 100	< 100	< 100	< 100	< 100	< 500	na	< 100	< 100	
W	EL	TCLP	6.7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 5:0	< 5.0	< 1.0	< 1.0	
W	EL	8240/8270	< 1200	< 1200	< 1200	< 1200	< 1200	< 1200	< 6200	na	< 1200	< 1200	
W	HE	TCLP	< 0.33	< 0.33	< 0.33	< 0.33	< 0.33	< 0.33	< 16	< 1.6	< 0 33	< 0.33	
W	HE	8240/8270	< 1200	< 1200	< 1200		< 1200	< 1200	< 6200	na	< 1200	< 1200	
M	LE	TCLP	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0 17	< 0.17	< 0.033	< 0.033	
M	LE	8240/8270	< 50	< 50	< 50		< 50	< 50	< 250	na	< 50	< 50	
M	MA	TCLP	< 0 67	4.4	< 0.67		< 0 67	< 0.67		< 3.3	< 0.67	< 0 67	
M	MA	8240/8270	< 100	< 100	< 100		< 100	< 100	< 500	na	< 100	< 100	
C	RE	TCLP	0.21	< 0.033	< 0.033		< 0 033	< 0 033	< 0 17	< 0 17	< 0.033	< 0.033	
C	RE	8240/8270	< 100	< 100	< 100	< 100	< 100	< 100	< 500	na	< 100	< 100	
		Parameter Reg. Limit	benzene 0.5	CC14 0.5	Cibenz 100		1.4-DCIB 7.5	1.2·DCA 0.5	1 1 DCE 0 7	MEK 200	PCE 0.7	1CE 05	VChloride
LAB		Reg. Limit ANALYSIS	0.5	0.5	100	6	7.5	05	07	200	0.7	0'5	02
M	a	Reg. Limit ANALYSIS TCLP	0.5 1 5	< 0.10	100 < 0.10	< 0.10	7.5 < 0 20	< 0.10	< 0.10	< 2.0	0.7	<u>0'5</u> < 0.10	< 0.20
M	Ci Ci	Reg. Limit ANALYSIS TCLP 8240/8270	0.5 	0.5< 0.10< 50	100 < 0.10 < 50	< 0.10 < 50	7.5< 0.20< 100	< 0.10 < 50	< 0.10 < 50	< 2.0 < 1000	0.7 0.61 96	0'5 < 0.10 410	< 0.20 < 100
M M W	CL CL DE	Reg. Limit ANALYSIS TCLP 6240/8270 TCLP	0.5 - 1 J - 50 < 0.10	0.5< 0.10< 50< 0.10	< 0.10 < 0.10 < 50 < 0.10	< 0.10 < 50 < 0.10	7.5 < 0.20 < 100 < 0.10	0.10< 50< 0.10	< 0.10 < 50 < 0.10	< 2.0 < 1000 < 2.0	0.61 96 0.16	< 0.10 410 < 0.10	< 0.20 < 100 < 0.20
W W	CL CL DE DE	Reg Limit ANALYSIS TCLP 8240/8270 TCLP 8240/8270	0.5 · 1 J · 50 < 0.10 < 60	0.5< 0.10< 50< 0.10< 60	< 0.10 < 50 < 0.10 < 60	< 0.10 < 50 < 0.10 < 60	7.5 < 0.20 < 100 < 0.10 < 60	< 0.10 < 50 < 0.10 < 60	< 0.10 < 50 < 0.10 < 60	< 2.0 < 1000 < 2.0 < 1200	0.7 0.61 96 0.16 720	0'5 < 0.10 410 < 0.10 < 60	< 0.20 < 100 < 0.20 < 0.20 < 1.20
M M W W	CL CL DE DE	Reg Limit ANALYSIS TCLP 8240/8270 TCLP 8240/8270 TCLP	0.5 - 1 J - 50 - < 0.10 - < 60 - < 0.10	< 0.10 < 50 < 0.10 < 60 < 0.10	< 0.10 < 50 < 0.10 < 60 < 0.10	< 0.10 < 50 < 0.10 < 60 < 0.10	7.5 < 0.20 < 100 < 0.10 < 60 < 0.10	< 0.10 < 50 < 0.10 < 60 < 0.10	< 0.10 < 50 < 0.10 < 60 < 0.10	< 2.0 < 1000 < 2.0 < 1200 3.9	0.7 0.61 96 0.16 720 2.8	0'5 < 0.10 410 < 0.10 < 60 < 0.10	< 0.20 < 100 < 0.20 < 0.20 < 120 < 0.20
W W W W	CL CL DE DE EL EL	Reg Limit ANALYSIS TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270	0.5 - 1 0 - 50 - 0.10 - 60 - 0.10 - 62	<pre></pre>	< 0.10 < 5.0 < 0.10 < 60 < 0.10 < 62	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62	<pre>7.5 < 0.20 < 100 < 0.10 < 60 < 0.10 < 62</pre>	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62	< 2.0 < 1000 < 2.0 < 1200 3.9 < 1200	0.7 0.61 96 0.16 720 2.8 930	0'5 < 0.10 410 < 0.10 < 60 < 0.10 < 62	< 0.20 < 100 < 0.20 < 0.20 < 120 < 0.20 < 120
W W W W	CL CL DE DE EL EL	Reg Limit ANALYSIS TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP	0.5 - 1 0 - 50 - 0.10 - 60 - 0.10 - 62 - 0.10	<0.10 <50 <0.10 <60 <0.10 <62 <0.10	< 0.10 < 5.0 < 0.10 < 6.0 < 0.10 < 6.2 < 0.10	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10	7.5 < 0.20 < 100 < 0.10 < 60 < 0.10 < 62 < 0.10	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10	200 < 2.0 < 1000 < 2.0 < 1200 3.9 < 1200 < 2.0	0.7 0.61 96 0.16 720 2.8 930 < 0.10	< 0.10 410 < 0.10 < 60 < 0.10 < 62 0.49	< 0.20 < 100 < 0.20 < 120 < 0.20 < 120 < 0.20
W W W W W	CL CL DE DE EL EL HE HE	Reg Limit ANALYSIS TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270	0.5 - 1 J - 50 - 0.10 - 60 - 62 - 0.10 - 62	<0.10 <50 <0.10 <60 <0.10 <62 <0.10 <62	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62 < 0.62	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62	7.5 < 0.20 < 100 < 0.10 < 60 < 0.10 < 62 < 0.10 90	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62	200 < 2.0 < 1000 < 2.0 < 1200 3.9 < 1200 < 2.0 < 1200 < 1200	0.61 96 0.16 720 2.8 930 < 0.10 1900	<pre>0'5 <0.10 410 <0.10 <60 <0.10 <62 0.49 <62</pre>	< 0.20 < 100 < 0.20 < 120 < 0.20 < 120 < 0.20 < 120
W W W W W W	CL CL DE DE EL HE HE	Reg Limit ANALYSIS TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP	0.5 - 1 J - 50 - 0.10 - 60 - 0.10 - 62 - 0.10 - 62 - 0.10	<pre></pre>	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62 < 0.10	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10	<pre>7.5 < 0.20 < 100 < 0.10 < 60 < 0.10 < 62 < 0.10 90 < 0.20</pre>	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62 < 0.10	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62 < 0.10	200 < 2.0 < 1000 < 2.0 < 1200 3.9 < 1200 < 2.0 < 1200 < 2.0 < 2.0 < 1200 < 2.0	0.7 0.61 96 0.16 720 2.8 930 <010 1900 0.58	<pre>0'5 <0.10 410 <0.10 <60 <0.10 <62 0.49 <62 <0.10</pre>	< 0.20 < 100 < 0.20 < 120 < 0.20 < 120 < 0.20 < 120 < 0.20
W W W W W W	CL CL DE DE EL EL HE HE	Reg Limit ANALYSIS TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270	0.5 - 1 J - 50 - 0.10 - 60 - 0.10 - 62 - 0.10 - 62 - 0.10 - 62 - 0.10 - 62 - 0.50	<pre></pre>	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62 < 50	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62 < 0.10 < 52	<pre>7.5 < 0.20 < 100 < 100 < 0.10 < 60 < 0.10 < 62 < 0.10 90 < 0.20 < 100</pre>	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62 < 50	<pre></pre>	200 < 2.0 < 1000 < 2.0 < 1200 3.9 < 1200 < 2.0 < 1200 < 2.0 < 1000	0.61 96 0.16 720 2.8 930 < 0.10 1900 0.58	<pre>0'5 <0.10 410 <0.10 <60 <0.10 <62 0.49 <62 <0.10 61</pre>	< 0.20 < 100 < 0.20 < 120 < 0.20 < 120 < 0.20 < 120 < 0.20 < 120 < 0.20 < 100
W W W W W W M M	CL CL DE DE EL EL HE HE LE	Reg Limit ANALYSIS TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP	0.5 - 1 0 - 50 - < 0.10 - < 60 - < 0.10 - < 62 - < 0.10 - < 62 - < 0.10 - < 50 - < 50 - < 50	<pre></pre>	< 0.10 < 5.0 < 0.10 < 6.0 < 0.10 < 6.2 < 0.10 < 6.2 < 0.10 < 6.2 < 0.10 < 5.0 < 0.10 < 5.0 < 0.10	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62 < 0.10 < 50 0.41	<pre>7.5 < 0.20 < 100 < 0.10 < 60 < 0.10 < 62 < 0.10 90 < 0.20 < 100 < 0.20</pre>	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 52 < 0.10 < 62 < 0.10	<pre></pre>	200 < 2.0 < 1000 < 2.0 < 1200 3.9 < 1200 < 2.0 < 1200 < 2.0 < 1200 < 2.0 < 1000 < 2.0	0.7 0.61 96 0.16 720 2.8 930 <0.10 1900 0.58 140 0.15	<pre>0'5 <0.10 410 <0.10 <60 <0.10 <62 0.49 <62 <0.10 61 <0.10</pre>	< 0.20 < 100 < 0.20 < 120 < 0.20 < 120 < 0.20 < 120 < 0.20 < 100 < 0.20
M W W W W W M M M	CL CL DE DE EL HE HE LE LE	Reg Limit ANALYSIS TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270	0.5 - 1 0 - 50 - < 0.10 - < 60 - < 0.10 - < 62 - < 0.10 - < 62 - < 0.10 - < 50 - < 50 - < 120	<pre></pre>	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62 < 0.10 < 62 < 100 < 120	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62 < 0.10 < 50 0.41 < 120	<pre>7.5 < 0.20 < 100 < 0.10 < 60 < 0.10 < 62 < 0.10 90 < 0.20 < 100 < 0.20 < 250</pre>	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62 < 0.10 < 62 < 0.10 < 120	<pre></pre>	200 < 2.0 < 1000 < 2.0 < 1200 3.9 < 1200 < 2.0 < 1200 < 2.0 < 1200 < 2.0 < 2.0 < 2500	0.7 0.61 96 0.16 720 2.8 930 <0.10 1900 0.58 140 0.15 <120	0'5 < 0.10 410 < 0.10 < 60 < 0.10 < 62 0.49 < 62 < 0.10 61 < 0.10 < 120	< 0.20 < 100 < 0.20 < 120 < 0.20 < 120 < 0.20 < 120 < 0.20 < 100 < 0.20 < 1500 < 1500 < 1500 < 1500
W W W W W W M M	CL DE DE EL EL HE LE LE MA MA RE	Reg Limit ANALYSIS TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270 TCLP 8240/8270	0.5 - 1 0 - 50 - < 0.10 - < 60 - < 0.10 - < 62 - < 0.10 - < 62 - < 0.10 - < 50 - < 50 - < 50	<pre></pre>	< 0.10 < 5.0 < 0.10 < 6.0 < 0.10 < 6.2 < 0.10 < 6.2 < 0.10 < 6.2 < 0.10 < 5.0 < 0.10 < 5.0 < 0.10	<pre>< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 62 < 0.10 < 62 < 0.10 < 50 < 0.10 < 50 < 0.00 </pre>	<pre>7.5 < 0.20 < 100 < 0.10 < 60 < 0.10 < 62 < 0.10 90 < 0.20 < 100 < 0.20</pre>	< 0.10 < 50 < 0.10 < 60 < 0.10 < 62 < 0.10 < 52 < 0.10 < 62 < 0.10	<pre></pre>	200 < 2.0 < 1000 < 2.0 < 1200 3.9 < 1200 < 2.0 < 1200 < 2.0 < 1200 < 2.0 < 1000 < 2.0	0.7 0.61 96 0.16 720 2.8 930 <0.10 1900 0.58 140 0.15	<pre>0'5 <0.10 410 <0.10 <60 <0.10 <62 0.49 <62 <0.10 61 <0.10</pre>	< 0.20 < 100 < 0.20 < 120 < 0.20 < 120 < 0.20 < 120 < 0.20 < 100 < 0.20

Parts Washer Solvent Wastes

Physical Properties and TCLP Metals Analysis, ppm

		Parameter	pH:	SG.	FP	. As	Ba	Cd	Cr	Pb	Hg	Se	Ag:
		Reg. Limit	<2 or >10	na	< 100	5	100		5	5	0.2		5
LAB	SITE	Ŋ											
M	CL		5.5	0.78	125	< 0.5	0.51	0.041	< 0 01	0.47	< 0.001	< 0.2	< 0.01
W	DE		0.5	0.7 99	110	< 0.05	0.6	< 0.05	< 0.05	1.3	< 0:01	< 0.05	< 0.05
W	EL		7	0.777	151	< 0.05	0:6	0.06	<:0.05	0:5	< 0.01	< 0.05	< 0.05
W	HE		6.5	0.775	95	< 0:05	1.2	0.07	< 0:05	1.2	< 0.01	< 0:05	< 0:05
M	LE		8	0.78	115	< 0.5	0.27	0:055	< 0.01	0.74	0.002	< 0.2	< 0.01
M	MA		6.5	0:8	110	< 0.5	< 1.0	0:059	0.017	16	0.0018	< 0.2	< 0.01
C	RE		8 ,	0.79	76	· <1	0.09	0.05	< 0.02	0.5	< 0.002	<1	< 0 05

TCLP Semi Volatiles Analysis, ppm

		Parameter	cresol	2.4-DNT	Cl6-benz Cl6-13-but		Cl6-eth	nitrobenz C15-phenol		pyridine	2.4:5-TCP	2.4.6-TCP	
		Reg. Limit	200	0.13	0.13	0.5	3	2	100	5	400	2	
LAB	SITE												
M	CL		9	< 0.033	< 0.033	< 0.033	< 0.033	< 0 033	< 0.17	< 0.17	< 0.033	< 0.033	
W	DE		3	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.17	< 0.17	< 0:033	< 0 033	
W	EL		6.7	< 1.0	< 1.0	< 1.0	< 1.0	< 10	< 5.0	< 5.0	< 1.0	< 1.0	•
W	HE		< 0.33	< 0:33	< 0:33	< 0.33	< 0.33	< 0.33	< 1.6	< 16	< 0.33	< 0.33	
M	lE		< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.033	< 0.17	< 0.17	< 0.033	< 0.033	
M	MA		< 0.67	4.4	< 0.67	< 0 67	< 0,67	< 0.67	< 3.3	< 3.3	< 0.67	< 0.67	• •
C	RE		0.21	< 0.033	< 0.033	< 0.033	< 0:033	< 0.033	< 0.17	< 0.17	< 0.033	< 0.033	

TCLP Volatiles Analysis, ppm

		Parameter	benzene	CC14	Cibenz	CHCI3	1.4-DCIB	1.2-DCA	1,1-DCE	MEX	PCE	TCE	VChloride
_		Reg. Limit	0.5	0.5	100	6	7.5	0.5	0.7	200	0.7	0.5	0.2
LAB	SITE												
M	a		< 0.10	< 0.10	< 0.10	<:0.10	< 0.20	< 0.10	< 0.10	< 2.0	0.61	< 0.10	< 0:20
W	DE		< 0.10	< 0.10	< 0.10	< 0 10	< 0.10	< 0.10	< 0.10	< 2:0	0.16	< 0 10	< 0:20
W	EL		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	3.9	2.8	< 0.10	< 0∶20
W	HE		< 0.10	<:0.10	< 0:10	< 0.10	<:0.10	< 0.10	< 0.10	< 2.0	< 0.10	0 49	< 0 20
M	LE		< 0.10	< 0.10	< 0.10	< 0.10	< 0 20	< 0.10	< 0.10	< 2:0	0 58	< 0.10	< 0 20
M	MA		0.15	< 0.10	< 0.10	0 41	< 0.20	< 0.10	< 0.10	< 2 0	0 15	< 0.10	< 0 20
C	RE		0 12	< 0.05	< 0.05	< 0.05	0.38	< 0.05	< 0:05	1.3	0 27	< 0:05	< 0:1

Dumpster Mud Wastes

Physical Properties and TCLP Metals Analysis, ppm

	Parameter	p 10	80	FP	As	Ða	Cd	Cı	פיו	ttg	Se	Ag
	Reg Limit	<2 or >10	Na:	< 100	5	100		5	5	02		5
e sii												
i a		10	na	115	< 0.5	0.85	0.8	0.06	2 2	0 002	< 0 2	< 0.01
/ DE	•	7	na	.80	< 0.05	1	0.84	< 0 05	570	< 0 01	< 0.05	< 0.05
/ EL		8	na	115	< 0 05	0 9	1.	< 0 05	13	< 0 01	< 0.05	< 0.05
1 LE		6 5	an an	85	< 0.5	0.47	2	0.01	13	< 0.001	< 0 2	< 0.01
; /Æ	;	79	1.2	85 .	< 1	0.41	2.8	0.05	4 6	< 0:002	< 1	< 0 5
ia		7.5	na	> 160	< 0.5	0.28	1.3	0.16	88	< 0.001	< 0.2	< 0 01

TCLP Somi Volatiles Analysis, ppm

		Parameter	cresol	2.4-DNT	CI6-benz	C16-13-but	CI6-eth	nitrobenz (CIS-phenol	pyridine	2.4.5 - ICP	2.4.6-TCP	
		Reg. Limit	200	0.13	0.13	0.5	3	2	100	5	400	. 2	
iō	SIIE							'					
W	Ci		10	< 0.33	< 0.33	< 0.33	< 0.33	< 0 33	< 1.7	< 1.7	< 0.33	< 0 33	
N	UE		5	< 0:033	<:0.033	< 0 033	< 0.033	< 0 033	< 0 17	<:017	< 0 033	< 0 033	
N	EL		96	< 0.091	< 0.091	< 0.091	< 0.091	< 0.091	< 0.46	< 0.46	< 0 091	< 0 091	
W	I E		< 0.033	< 0.033	< 0.033	< 0.033	< 0 033	< 0.033	< 0.17	< 0.17	< 0 033	< 0 033	
C	NE		0:68	< 0.068	< 0.066	< 0.066	< 0.066	< 0.066	< 0.34	< 0 34	< 0.066	< 0.066	
W	a		22	< 0.67	< 0:67	< 0.67	< 0.67	< 0.67	< 3.3	<.3.3	<:0:67	< 0.67	•

TCLP Volatiles Analysis, ppm

	Para	meler	benzene	CC14	Cibenz	CHCI3	1.4: DCID	1.2-DCA	1.1-DCE	MEX	PCE	1CE	VChlorkle
	Reg	Limit	0.5	0:5	100	6	7.5	0.5	0 7	200	0.7	0.5	0 2
ÄB	SIE												
ÀÖ	-a		011	< 0.10	< 0.10	< 0.10	< 0.20	< 0.10	< 0 10	< 2 0	0 96	< 0 10	< 0 20
W	DE		0 52	< 0 10	< 0.10	< 0.10	< 0.10	< 0 10	< 0 10	< 2:0	< 0 10	< 0 10	< 0.20
W	El		< 0.10	< 0 10	< 0.10	< 0 10	< 0 10	< 0 10	< 0 10	< 2 0	0 16	< 0 10	< 0 20
M	1E		< 0 10	< 0 10	< 0 10	< 0 10	0 52	< 0 10	< 0.10	< 2.0	0 64	< 0 10	< 0 20
C	NE		0.1	< 0.05	< 0 05	< 0:05	< 0.1	< 0 05	< 0 05	15	0 17	Ó 14	< 0 1
M	Cl		< 0.10	0 17	4:3	< 0.10	> 4 4	< 0.10	< 0.10	< 20	36	0 45	< 0 20

Dumpster Mud Wastes

Volatile Organics (EPA 8240) Analysis, ppm

Paran	neter	CHICH	C11304	C2H3CI	C2115C1	CH2CI2	acetone	CS2	1.1-DCE	1.1-DCA	1.2-DCE	CHC
AB .	SILE											
M	CL	< 100	< 100	< 100	< 100	< 50	< 1000	< 50	< 50	< 50	< 50	25
W	DE	< 10	< 10	< 10	< 10	< 50	< 100	< 5.0	< 5.0	< 5 0	< 5 0	< 5 (
W	EL	< 110	< 110	< 110	< 110	< 55	< 1100	< 55	< 55	< 55	< 55	< 5
M	lE	< 330	< 330	< 330	< 330	610	< 3300	< 170	< 170	< 170	< 170	< 170
C	NE .	< 1000	< 1000	< 1000	< 1000	< 500	< 10000	< 500	< 500	< 500	< 500	< 500
Para	neler	1,2·DCA	MEK	1.1.1-TCA	ССИ	v-acetale	CHDiCI2	1.2-DCPA	1.3-DCPE	1CE	CHB ₁ 2CI	1 1 2 · 1C/
LÃÔ	ŠIIE											
M	CL	< 50	< 1000	48	< 50	< 500	< 50	< 50	< 50	< 50	< 50	< 50
W	DE	< 5 0	< 100	. 91	<50	< 50	< 5.0	< 5.0	< 5 0	64	< 50	< 5 (
W	EL	< 55	< 1100	750	< 55	< 550	< 55	< 55	< 55	< 55	< 55	< 55
M	l E	< 170	< 3300	1500	< 170	< 1700	< 1/0	< 170	< 1/0	< 170	< 170	< 1/0
C	HE	< 500	< 10000	2300	< 500	< 2500	< 500	< 500	< 500	< 500	< 500	< 500
raa.	meter	penzene	3-CVE	1.3-DCPE	CHBi3	Me-2-pen	2-hex'one	PCE	1.1.2.2PCA	toluene	Cl·benz	eth-bena
LÄÖ	SILE											
M	CL	< 50	< 100	< 50	< 50	< 500	< 500	230	< 50	440	< 50	150
W	DE	52	4. ▮	< 50	< 50	< 50	< 50	84	< 5 0	550	< 50	270
W	EL	< 55	< 110	< 55	< 55	< 550	< 550	740	< 55	500	430	1700
M	LE	< 170	< 330	< 170	< 170	< 1700	. < 1700	260	< 170	530	< 170	200
C	HE	< 500	< 1000	< 500	< 500	< 5000	< 5000	1000	< 500	4600	< 500	1800
Para	meler	styrene	xylenes	1.2-DCIB	1.3-DC(8	1.4-DC(0			•		•	
	SITE				· 		,					
M	CL	< 50	1200	< 100	< 100	< 100						
W	DE	< 50	13000	< 50	47	< 50						
W	EL	< 55	1200	250	< 55	100						
A	IE	< 170	1400	<1/0	<170	<170						

Dumpster Mud Wastes

Semivolatile Organics (EPA 8270) Analysis, ppm

'arai	meler	1 Inscrin-E	acenaphthe	2.4dntrophe	4ntropheno	i dibeniuran	2.4-UNI	l edhiddhab	4Clphenph	e fluorene	4-niroanii	4.6dn2Mep
ÄÄ	SILE											
M	<u>-ā</u> -	< 11000	< 2200	< 11000	< 11000	< 2200	< 2200	< 2200	< 2200	< 2200	< 11000	< 11000
W	DE	< 15	< 3:0	< 15	< 15	< 3.0	< 30	< 3.0	< 30	< 30	< 15	< 15
W	EL	< 5300	< 1100	< 5300	< 5300	< 1100	< 1100	< 1100	< 1100	< 1100	< 5300	< 5300
M	l E	< 310	< 63	< 310	< 310	< 63	< 63	< 63	< 63	< 63	< 310	< 310
C	NE	< 500	< 100	< 500	< 500	< 100	< 100	< 100	< 100	< 100	< 500	< 500
M	a	< 12000	< 2500	< 12000	< 12000	< 2500	< 2500	< 2500	< 2500	< 2500	< 12000	< 12000
	noler	N-nitraso	4Drphenph	Cl6benzene	Cl5phenol	phenanthre	anthracene	d-n-bulphi	Nuoranthen	pyrene	butbenphth	3.3'Cl2beni
AB	SITE											
M	a	< 2200	< 2200	< 2200	< 11000	< 2200	< 2200	< 2200	< 2200	< 2200	< 2200	< 4400
W	DE	< 3.0	< 3.0	< 30	< 15	5 2	< 3:0	20	< 3:0	< 30	< 30	< 6 0
W	EL	< 1100	< 1100	< 1100	< 5300	< 1100	< 1100	< 1100	< 1100	< 1100	< 1100	< 2100
M	lE	< 63	< 63	< 63	< 310	< 63	< 63	< 63	< 63	< 63	< 63	< 130
C	NE	< 100	< 100	< 100	< 500	< 100	< 100	210	< .100	< 100	920	< 200
M	a	< 2500	< 2500	< 2500	< 12000	< 2500	< 2500	< 2500	< 2500	< 2500	< 2500	< 5100
Para	moler	benjajanth	chrysene	b2ethhexph	d-n-octphi	benjujiluor	benjk jiluor	benjájpyren	 Ind 123-cd	dbenja.hjar	ben(ghi)per	
ÌÃĐ	SILE							^				
M	CL	< 2200	< 2200	< 2200	< 2200	< 2200	< 2200	< 2200	< 2200	< 2200	< 2200	
w	DE	< 3.0	< 3.0	50	< 3:0	< 30	< 30	< 30	< 30	< 30	< 3:0	
W	EL	< 1100	< 1100	< 1100	< 1100	< 1100	< 1100	< 1100	< 1100	< 1100	< 1100	
M	lE	< 63	< 63	110	< 63	< 63	< 63	< 63	< 63	< 63	< 63	
C	NE	< 100	< 100	1700	100	< 100	< 100	< 100	< 100	< 100	< 100	•
M	CL	< 2500	< 2500	< 2500	< 2500	< 2500	< 2500	< 2500	< 2500	< 2500	< 2500	



General inorganics

			SEDIC CT31	ELUSEDIC 17 OCT \$1		CLUSE CINEW Formula) 10 DEC 91	
<u>.</u> .		. 11	Reporting	D ane	Reporting	Sec. 4	Reporting
Parameter	Limits	Result	Limit	Result	Limit	Result	لتعظ
Specific Gravity et 77 degrees F	g/cc	0.938	-	0.958	-	0.945	-
ignitability	deg.F	>160	-)150	-	>160	- 1
pH	units	9.6	-	98	-	9.6	- 1

		(CHLOFI CLUS 16 CC	EDIC
Parameter	Ueiks	Result	Reporting Limit
Specific Gravity of	gicc	1.119	-
lgmlability	deg.F	138	-
Hiq	units	9.4	•



OTC Volatile Organics TCLP Leachate

Method 8240						NEWF	OFMULA
		ಚಚ	EDIC	ELU	SEDIC	au	SEDIC
		26 Ci	EC91	180	EC91	100	EC 91
•			Reporting		Reporting		Reporting
Parameter	Units	Result	Limit	Result	Lincit	Result	Link
Vinyl Chloride	mg:L	NO	6500	ND	5000	ND	5000
1,1 Dichleroethene	mg/L	ND	3300	ND	2500	ND	2508
Chioroform	mg/L	NO	3300	NO	2500	NO	2500
1,2 Dichloroethane	mg/L	ND	3380	ND	2506	ND	2500
2-Butenone	mg/L	NO	6688	ND	5000	ND	5000
Caroon Tetrachionide	mg/L	ND	3300	ND	2500	ND	2500
Trichlemethene	mg/L	NĐ	3390	NO	2500	ND	2500
Benzene	marL	ND	3300	NO	2500	ND	2580
Tetrachioroethene	mg-L	NO	3300	ND	2509	ND	2509
Chlorobenzene	mg/L	ND	3300	ND	2500	ND	2500

		CLUSEDIC (CHLORINA) 16 Oct 91					
Perameter	Units	Result	Reporting Limit				
Vinyt Chloride	mg/L	ND	200				
1,1 Dicitoroethene	mg/i	NO	100				
Chlorotom	mg/L	ND	789				
1,2 Dichlorosthane	mg/i	NO	100				
2-Eutanone	MOAL	NO	298				
Carbon Tetrachloride	mg/l	OM	190				
Inchioroemene	mg/L	ND	100				
Benzene	mg/L	NO	100				
Tetachioroeinene	mg/L	ND	007				
Diaminenzene	നവർ	NO	166				



OTC Semivolatile Organics TCLP Leachate Method 8270

						NEWF	ORMULA
		iEU	නෙස	ELU	een k	au	SEDIC
		69 0	88 OCT 91		CT 91	18 DEC 51	
			Reporting		Reporting		Reporting
Parameter	Units	Result	Limit	Result	Link	Result	Limit
Pyricine	mg/L	ND	10.0	ND	200	ND	20.0
1,4-Dichlorobenzene	mg/L	ND	5.0	ND	100	ND	18.0
2-Methylphenol	mg/L	ND	5.0	ND	190	ND	10.0
3/4 Methylphenol	mg/L	ND	5.0	ND	189	ND	10.0
Heractionethane	mg/L	ND	5.0	ND	100	ND	10.0
Nirobenzene	mg/L	NÔ	5.0	NO	198	NO	18.0
Heactionobitations	mat	NO	5.0	ND C34	100	ND	10.8
2,46-Tachlorophenol	mg/L	ND	5.0	NO	100	ND	10.0
245-Trichlorophenol	mg/L	ND	25.0	ND	580	ND	50.8
2.4-Dinitrololuene	mg/L	ND	5.8	NĐ	188	ND	10.0
Hexechlorobenzene	mg/L	NO	5.0	ND	190	ND.	10.0
Pentechlorophenol	mg/L	ND	25.0	ND	500	ND	58.0

		CINSECIC	lomated
		16 OCT 31	
			Reporting
Perameter	Units	Result	Limit
Deidina		ND	40000
Pyridine	mg/L	• • -	1
1,4 Dichlorobenzene	mg/L	72000	20000
2-Methytphenol	mgiL	58000	20006
3/4 Methylphenol	mg/L	54900	20000
Heractionsethane	mgri.	ND	23000
Mindenzene	mgi.	ND	20000
Herachlorobutadiene	ngL	NO	20000
2,4,6-Tachicappenol	way	HD.	20000
2,4,5-Trichlorophenol	mgA	ИĐ	199000
2,4-Dingrotokene	രൂർ	NED	20000
Herechlambenzene	mgA_	ND	20000
Pentactiorophenol	mg/L	ΝÜ	100000



TCL Volatile Organics Method 8240

PREW FORMULA)
CLUSEDIC
10DEC91

		102	C331
		4	Reporting
Parameter	Uaits	Result	Limit
Chicromethane	mg/kg	NO	5000
Bromometions	mg/kg	ND	5000
Vinyl Chloride	mg/kg	NO '	5000
Chloroethane	mg/kg	ND	6000
Methylene chloride	wō\kā	ND	2500
ACETORE	wāķā	ND .	5000
Carbon disulfide	maya	ND	2500
1,1 - Dichlomethene	mg/kg	ND I	2560
1,1-Cictorcethane	यार्वक्रिय	ND	2500
1,2 - Dichloroethens	mg/kg	10	2500
(cis/tens)			
Chicacion	mg/kg	NO	2539
1,2-Dichloroethane	mg/kg	ND	2508
2-Butanone	mg/kg	ND	5000
1,1,1 - Trichlemethana	mg/kg	NO	2500
Carbon extractiloride	mg/kg	ND	2504
Vinyl Acetate	mg/kg	NO	5008
Siomodictionmetiane	mg/kg	NĐ	2500
1,2 - Dichioropropene	mg/kg	ND	2500
cis-1,3-Dichloropropene	ang/kg	NO	2506
Trichlomethene	mg/kg	ND	2500
Dibromochloromethene	mg/kg	NO	2500
1,1,2 - Trichlomethane	mg/kg	ND	2500
Benzene	mg/kg	ND NO	2588
tens-1,3-Cicinorpaopene	ताव्येष्य	ND:	2500
2 - Circonnetty! yanyi ether	mg/kg	NO	5169
Bromotom	angrikg	NO	2500
4-Mathyl-2-pertenone	mg/kg	NED	5000
2-Heignone	mg/kg	ND	5000
1,122 - Tetrachlomethane	DATOM	NO	2500
Tetrechlorsethene	mg/kg	ND	2598
Towere	mg/kg	ND	2500
Chlorobenzene	mg/kg	NO	2569
Ethylberzene	urbyrd	NO	2500
Syrene	mgskg	ΝŨ	2500
Artenes mital	mg-kg	ND CH	2500



TCL Semivolatile Organics Method 8270

NEWFORMULA

GLUSED 10 10 DEC 31

		140	Reporting
Parameter	Umīs	Result	Limit
1-Graneses	Cillia	THEOLOGIC	
Phenos	mgātā	ND	10000
bis(2 - Chiorethyr) ether	កាច្ចកំណូ	HD)	10000
2 - Chlorophenol	mg/kg	ND	10009
1,3-Dictiorobenzene	mg/kg	NĐ	10000
1.4-Dichlorobenzene	mg/kg	ND)	19606
Benzyl elcohol	mg/kg	ND	19003
1,2-Dichlorobenzene	mg/kg	NO	10000
2-Mebylphenol	mg/kg	(2 /	18000
bis(2 - Chioroisepropyl) - ether	mg/kg	NO	19000
4-Methylphenoi	mg/kg	NO	19800
N-Nitroso-di-	mg/kg	NO	10060
à-propylemine	• •		
Heachioroethane	mg/kg	NO	18000
Närobenzene	mg/kg	NO	10000
sociacies	mg/kg	NO	19890
2-Nitrophenoi	mg/kg	NO	18000
24-Dimethylphenol	mging	NO	19000
Senzoic acid	mg/kg	ND	50000
bis(2-Chloroethoxy)-	mg/kg	ND	10000
methene			
2,4-Dichlorephenol	mg/kg	ND	18000
124-Trichlombenzene	mgfkg	NO	19600
Nechelene	ಬರ್ಭನ	47008	1990
4 - Chloroaniine	mg/kg	МD	19000
Hexachiorobutadiene	លបូរីល្	NC	15500
4-Chloro-3-methylphenol	mgikg	NO	1999)
2-Methylnephthalene	mgikg	NĐ	10000
Hexachtorocyclopentaciene	සන්න	NO	:000
2,4,6-Trichterophenol	wayka	ND	1000G
245-Trichiörophenol	ಜಕ್ಕುಗ್ತ	NŪ	50000
2-Orlorenaphalene	wâyâ	ND:	1960
2-Naroaniine	wāţĸā	ND	Ships
टिशास्त्रीए। ह्रांफीशंखर	mg/kg	ND	1966
Accomplished	wōkā	10	12000
3-Nitroaniine	udyd	ND.	5500
Acenaphinene	wowi	NO	19066
24-Dinimphenoi	wōyā	NO - 2	50000
4-Navodienoi	which	ND	5500



LISED PAMEESTAN (LEANER

	Constitued for	m previous pa	32 <i>-</i>
Dibenzoiuran	mg/kg	NO	1(144)
24-Dinitotoivene	mgākg	G 4	1000
26-Dinitorolisene	mgkg	HĐ	10000
Cietty! phthatate	mg/kg	NO.	19000
4- Chlorochenyl	mg/kg	ND	10000
phenyl etter			
Flourene	mg/kg	ND	10000
4-Nitroanime	mg/kg	Q 4	50000
46 - Dinitro-	mg/kg	ND	50000
2-Methylphenol		1	
N-Nicosociphenylanuse	mgAg	HO HO	19990
4-Bromophenyi	mg/kg	NO	10000
phenyi ether		•	
Hexachlorobenzene	mg/kg	ND .	19000
Pentachioropnenol	mg/kg	NO	50000
Phenentrene	mg/kg	Œf	19000
Arthracene	mg/kg	ND	10808
Di-n-bulyi phihaiale	mg/kg	ND	10000
Flouranthène	mg/kg	ND	10000
Pyrene	mg/kg	ND	10000
Buryl benzyl phinsiste	mg/kg	NO	10000
3,3 - Dichlombergioine	ಪ್ರಭಾಗಿತ್ತ	G f	29000
Benzo (a) antiracene	mg/kg	ND	10000
bis(2-Ethythexyl)	mg/kg	铋	12000
pirmetate			
Chrysene	mgring	NO	18660
Di-n-odyl pathelete	mg/kg	NO	10006
Benzo (b) fourenthene	majira	NO	10000
Benzo (X) fourammene	mg/kg	ND	10000
Benzo (a) pyrene	ಬರಿಸಿದ	ND	10000
Indeno (1.2,3-cd) pyrene	mg/kg	NO	1000
Dibenz (a,is) asstracene	mgAg	NO	16000
Benzo (g.h.j) peryiene	mg/kg	NO	10000



Total Metals
TCLP Leachate

			SEDIC ICT SI	ELUSEDIC 17 OCT 91		CLUSEIC(New Formula) 18 DEC 91	
Parameter	Units	Result	Reporting Limit	Result	Reporting Limit	Result	Reporting
Arsenic	mg/L	NO	5.8	1.8	1.0	2.1	1.0
Banum	mg/L	9.54	0.5	0.58	ខា	1.4	8.1
Cadmium	mg/L	129	0.25	9.2	0.05	11.6	0.05
Chromium	mg/L	47	0.5	15	0.1	50.5	0.1
Lead	mg/L	43.4	2.5	86.3	0.5	55.1	0.5
Mercury	mg/L	ND	0.082	NO	0.002	ND:	0.002
Selenium	mg/L	ND	0.5	ND	20	NO	0.1
Säver	mg/L	ND	0.5	ND	8.1	0.1	0.1

		OLUSEDIC CHLOFINATED 16 OCT 91		
Parameter	Units	Result	Reporting Limit	
Arsenic	mg/L	ND	1.0	
Berium	mg/L	3.7	0.1	
Cedmann	mg/L	45.8	205	
Chromium	mgs.	27.8	9.1	
تعفن	mg/i	159	0.5	
Mercury	mg <u>4</u>	ND	2,902	
Selenium	mg/L	ΝĐ	9.25	
Silver	muL	ND	9.7	



General Inorganics

		HEUSEDOCHUCK 24 OCT 91		DENTON PERCHUCK 25 OCT 91	
Parameter	Units	Result	Reporting Limit	Result	Reporting Limit
Specific Gravity at 77 degrees F	g/cc	0.976		•	•
ignitability	deg.F	>160	-	-	-
pH	unis	5.5	-	5	-
Flash point (PMCC)	deg.F	•	- 1	>180	-

. ...



OTC Volatile Organics
TCLP Leachate
Method 8240

		HEUSEDDOMJOK 24 OCT 91		DENTON PERCMUO 25 OCT 91	
Parameter		4	Reporting	_	Reporting
	Uaits	Result	Limit	Result	Limit
Vinyt Chloride	mg/L	ND	170	QM	100
1,1 Dictionethene	mg/L	ND	84	NO	50
Chlorosom	mg/L	ND	84	NO	50
1,2 Dictionnethane	mg/L	NO	84	ND	50
2-Butanone	mg/L	ND	170	ND	508
Carbon Tetrachloride	mg/L	ND	84	NO	50
Trichloroethene	mg/L	ND	84	NO	59
Benzene	mg/L	140	84	NO	59
Tetrachloroethene	mg/L	490	84	790	50
Chlorobenzene	mgi.	ND	84	ND	59

•



OTC Semivolatile Organics TCLP Leachate Method 8270

Result NO NO NO	Reporting Limit 40 20	Result ND ND	Reporting Limit
NO	20		2
		NO	•
ND			- 4
	20	ND	2
NO	2.0	ND	2
NO	20	ND	2
NO	29	ND	2
NO	20	ND	. 2
ND	20	NO	2
	10.9	NO	2
	28	ND	2
_	28	ND	2
ND	10.8	ND	19
	53 53 53 53 53 53 53 53 53 53 53 53 53 5	ND 28 ND 29 ND 29 ND 20 ND 20 ND 108 ND 28 ND 28	ND 28 ND ND ND 20 ND ND 20 ND ND ND ND ND ND ND ND ND ND ND ND ND



Total Metals TCLP Leachate

		HEUSEDDOMUCK 24 OCT 91		DENTON PERCHUCK 25 OCT 91	
Parameter	Units	Result	Reporting Limit	Result	Reporting Limit
Arsenic	mg·L	NO	1.0	ND	8.5
Barium	mg/L	9.12	0.1	0.5	£1
Cadmium	mg/L	0.15	0.05	ND	0.1
Chromium	mg/L	NO	0.1	1	0.1
Lead	mg/L	ND	0.5	9.8	0.1 j
Mercury	mg/L	ND	0.002	NO	0.02
Selenium	mg/L	ND	0.5	ND	8.3
Silver	mg/L	ND	0.1	NO	21



USED DRYCLEANER BOTTOM

General Inorganics

				DENTON		
	i	HEUSEDDOBOT 23 OCT 91		PERC COOKER SOLD 25 OCT 91		
	e .		Reporting		Reporting	
Perameter	Units	Result	Limit	Result	أهزا	
Specific Gravity at 77 degrees F	g/cc	1.05	; -	-	. •	
ignitability	deg.F	>168		-	- 1	
рH	unës	6.3		7	- 1	
Flash point (PMCC)	deg.F	•		>180]	



USED DRYCLEANER BOTTOMS

OTC Volatile Organics TCLP Leachate Method 8240

		HELISE	DOCSOT DE	NTON PERC	COOKER SOLIDS	,
		230	CT 91	250	टा श	
Perameter			Reporting		Reporting	
	Units	Result	Limit	Result	Limit	
Vinyl Chloride	mg/L	ND	2000	NO	0.08	
1,1 Dichloroethene	mg/L	NE	1600	NO	en	
Chioroform	1759/L	Ю	1000	NU	004	
1,2 Dicition einane	mgi.	NO	2000	NO	0.04	
2-Extendre	mg/L	ND	1966	ND	8.4	
Cerbon Tetrectionide	mg/L	ND	1000	NO	8.04	
Trichioroethene	mg/L	NO	1600	NO	8.84	
Benzene	mg/L	NO	1998	NO	0.94	
Tetrachloroethene	mg/L	4800	1988	0.9	8.04	
Chlorobenzene	mg/L	NO	1800	ND	0.04	

₹.



USED DRYCLEANER BOTTOM OTC Semivolatile Organics

OTC Semivolatile Organics TCLP Leachate Method 8270

		HOTHER			
		HELSE	DCBOT I	PERC COO	KERSOLOS
		19 DE	C91	250	CLAI
			Reporting		Reporting
Parameter	Units	Result	Limit	Result	Limit
Pyridine	mg/L	ND	2.6	ND	0.04
1,4 Dichlorobenzene	mg/L	ND	1.0	ND	0.94
2-Methylphenoi	mg/L	ND	1.6	0.34	0.04
3/4 Methylphenol	mg/L	ND	1.8	0.34	9.04
Herachiomethene	mg/L	ND	1.6	ND	0.04
Nimbenzene	mg/L	ND	1.0	NO	8.04
Heachlorobulariere	mgd	NO	1.0	ND	8.04
2.46-Trichlorophenol	mg/L	ND	1.8	NĎ	0.04
2.45-Trichlorophenol	mg/L	NO	5.0	ND	8.04
24-Dinitrotoluene	mg/L	NO	1.0	NO	8.04
i-iexachiorobenzene	mgrL	ND	្រែ	ND	8.84
Pentachlorophenol	mg/L	ND	:58	NO	82
•			1		
					j
			1		1



USED DRY CLEANER BOTTOMS

Total Metals

			CENTON				
		HEUSEDDCEOT		PERC COOKER SOLDS			
		23 0	CT91	250	OCT 91		
			Reporting		Reporting		
Parameter	Ueik	Result	Limit	Result	Limit		
Arsenic	mgiL	ND	1.4	ND	85		
Berium	mg/L	1.6	0.14	0.4	0.1		
Cadmium	mg/L	0.19	9.063	ũ	in i		
Chronisan	ನ್ನಾಗಿ	17.4	0.14	82	9.1		
Lead	mg/L	49	0.69	55	9.1		
Hercury	myrL.	NO	9.011	ND	0.02		
Selenium	ಪರಕ್ಷ	ND	9.28	ND	0.3		
Sirver	mg/L	ND	0.14	NĐ	8.1		

Paint Gun Cleaner Wastes

Physical Properties and TCLP Analysis, ppm

Parameter	Reg. Limit	≠ Samp	Avg	Min	Max
pH	<2 or >10	2	6.3	6.0	6.5
SG	na	2	0.894	0.851	0.937
FP	< 100	2	75	75	75
As	5	. 2	0.00	0.00	0.00
Ba	100	. 2	0.80	0.60	1.00
Cd	1	2	0.36	0.00	0.72
Cr	5	<u> </u>	0.46	0.21	0.72
Pb.	5	· 2	1.35	0.30	2.40
Hg	0.2	. 2	0.00	0.00	0.00
Şe	1	. 2	0.00	0.00	0.00
Ag :	5	2	0.00	0.00	0.00
cresol	200	. 2	4.85	0.00	9.70
2.4-DNT	0.13	2	0.00	0.60	0.00
CI6-benz	0.13	2	0.00	0.00	0.00
C16-13-but	0.5	2	0.00	0.00	0.00
Cl6-eth	3	2	0.00	0.00	0.00
nitrobenz	2	2	0.00	0.00	0.00
CI5-phenol	100	2	- 0.00	0.00	0.00
pyridine	5	, 2	0.00	0.00	0.00
2.4.5-TCP	400	2	0.00	0.00	0.00
2.4.6-TCP	2	2	0.00	0.00	0.00
benzene	0.5	2	0.16	0.14	0.18
CCI4	0.5	. 2	0.00	0.00	0.00
Cibenz	100	2	0.00	0.00	0.00
CHCI3	- 6	. 2	0.00	0.00	0.00
1.4-DCIB	7.5	' 2	0.00	0.00	0.00
1.2-DCA	0.5	2	0.06	0.00	0.12
1.1-DCE	0.7	2	0.00	0.00	0.00
MEK	200	2	2100.00	200.00	4000.00
PCE	0.7	1 2	0.31	0.00	0.61
TCE	0.5	2	0.80	0.00	1.60
VChloride	0.2	2	0.00	0.00	0.00

Less than values are treated as zeros in the statistical analysis Greater than values are treated as the value in the statistical analysis

Paint Gun Cleaner Wastes

Semivolatile Organics (EPA 8270) Analysis, ppm

W DO < 1100	Parar	neler	phenol	b-2Cl-ethr	2CI-phenol	1.3-DCIB	1.4-DCIB	benzyl 'ol	1.2-DCIB	2Me-pheno	b-2CI-IPE	4Me-pheno	N-ntroso
### DO	LAB	SITE											
Parameter C2Cl6 nitrobenz teophorone 2ntroph'ol 2.4Meph'ol benz acid b-2Clethox 2.4-dClph 1.2.4-TCl8 Naph'ene 4-Claniline	W	DE	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000
LAB SITE W DE	W	DO	< 1100	< 1100	< 1100	< 1100	< 1100	< 2100	< 1100	< 1100	< 1100	< 1100	< 1100
W DE	Para	meler	C2C16	nkrabenz	isophorone	2ntroph of	2.4Meph'ol	benz acid	b-2Clethox	2,4-dClph	1.2.4-TCIB	Naph'ene	4-Claniline
Parameter Clébutadien 4Cl3Mephnt 2-Menaph Clécycpent 2.4.6iClph 2.4.5iClph 2.Clnaph 2.niroanil Me2phthal acenaphthy 2.6.DNT	LAB	SITE											
Parameter Cisbutadien 4Cl3Mephnil 2-Menaph Ciscycpent 2.4.6iClph 2.4.5iClph 2.Clnaph 2-ntroanit Me2phthal acenaphthy 2.6-DNT	W	DE	< 1000	< 1000	< 1000	< 1000	< 1000	< 5000	< 1000	< 1000	< 1000	< 1000	< 1000
AB SITE W DE < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 <	W	DO	< 1100	< 1100	< 1100	< 1100	< 1.100	< 5300	< 1100	< 1100	< 1100	< 1100	< 2100
W DE	Para	meler	Cl6butadie	n 4Cl3Mephn	l 2-Menaph	Cl6cycpent	2.4.6(Clph	2.4.5(Clph	2-Clnaph	2-ntroanil	Me2phthal	acenaphthy	2.6-DNT
Parameter 3-ntroanii acenaphthe 2-4dntrophe 4ntrophenol dibeniuran 2.4-DNT deliphihai 4Clphenphe liuorene 4-ntroanii 4.6dn2Mep 1AB SITE W DE < 5000 < 1000 < 5000 < 5000 < 5000 < 1000 < 1000 < 1000 < 1000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000	LAB	SITE											
Parameter 3-ntroanii acenaphthe 2.4dntrophe 4ntrophenol dibeniuran 2.4-DNT delhphihai 4Ciphenphe liuorene 4-ntroanii 4.6dn2Map 1AB SITE W DE < 5000 < 1000 < 5000 < 5000 < 5000 < 1000 < 1000 < 1000 < 1000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000 < 5000	W	DE	< 1000	< 1000	< 1000	< 1000	< 1000	< 5000	< 1000	< 5000	< 1000	< 1000	< 1000
N DE	w	DO	< 1100	< 2100	< 1100	< 1100	< 1100	< 1100	< 1100	< 5300	< 1100	< 1100	< 1100
W DE < 5000 < 1000 < 1000 < 1000 < 1000 < 5000 < 5000 W DO < 5300 < 1100 < 1100 < 1100 < 1100 < 1100 < 1100 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 5300 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000			3-ntroanil	acenaphthe	2.4dntraphe	4ntropheno	l dibenluran	2.4-DNT	dethphihai	4Clphenphe	Nucrene	4-ntroanil	4.6dn2Mep
Parameter N-nitroso 4Brphenph Cl6benzene Cl5phenol phenanthre anthracene d-n-butpht Huoranthen pyrene butbenphth 3.3 Cl2benzene Cl5phenol phenanthre anthracene d-n-butpht Huoranthen pyrene butbenphth 3.3 Cl2benzene Cl5phenol phenanthre anthracene d-n-butpht Huoranthen pyrene butbenphth 3.3 Cl2benzene Cl5phenol phenanthre anthracene d-n-butpht Huoranthen pyrene butbenphth 3.3 Cl2benzene Cl5phenol Cl6benzene Cl5phenol phenanthre anthracene d-n-butpht Huoranthen pyrene butbenphth 3.3 Cl2benzene Cl6benzene Cl5phenol phenanthre anthracene d-n-butpht Huoranthen pyrene butbenphth 3.3 Cl2benzene Cl6benzene Cl5phenol Cl6benzene Cl5phenol phenanthre anthracene d-n-butpht Huoranthen pyrene butbenphth 3.3 Cl2benzene Cl6benzene Cl6benzene Cl5phenol Cl6benzene Cl5phenol Cl6benzene Cl5phenol Cl6benzene Cl5phenol Cl6benzene Cl5phenol Cl6benzene Cl5phenol Cl6benzene Cl5phenol Cl6benzene Cl6ben								· · · · · · · · · · · · · · · · · · ·					
Parameter N-nitroso 4Brphenph Cl6benzene Cl5phenot phenanthre anthracene d-n-bulpht Nuoranthen pyrene butbenphth 3.3 Cl2ben. LAB SITE W DE < 1000													
LAB SITE W DE	W	DO	< 5300	< 1100	< 5300	< 5300	< 1100	< 1100	< 1100	< 1100	< 1100	< 5300	< 5300
N DE	Para	meler	N-nitroso	4Brphenph	Clibenzene	Cl5phenol	phenanthre	anthracene	d-n-butpht	Nuoranthen	pytene	butbenohth	3.3°Cl2benz
W DE	LAB	SITE		·							- L-L		
W DO < 1100			< 1000	< 1000	< 1000	< 5000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 2000
LAB SITE W DE < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000	W	DO	< 1100	< 1100	< 1100	< 5300	< 1100	< 1100	< 1100	< 1000	< 1100	1600	
LAB SITE W DE < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000	P2/1	meler	benislanih	chrysene	b2alhhaxnh	d-n-ociohi	benibiliuor	benikiliwor	benialowen	indi 123-cai	d beni a hisa	benighilner.	
W DE < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000 < 1000													
			< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	< 1000	
		_											



TEI ANALYTICAL, INC.

November 29, 1989

LABORATORY REPORT

\$3995

Safety-Rieen Corporation

Page 2 of 2 pages

TELP Organics

All results are expressed as ppm unless otherwise indicated. LT = Less Than

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	TZI-70008
Acrylonitrile	Grude Feed from 2nd rial at C/9
Sensene	W 0.5
Bis 2 Chloroethyl Sther	(1.3)
Carbon Disulfide	L7 0.05
Carbon Tetrachloride	LT 0.05 LT 0.05
Chlorobeazene	• • • • • • • • • • • • • • • • • • •
Chlorotora	LT G.OE
o-Cresol	<u>u</u> 0.05
n-Crasol	W 0.5-
p-Crase1	LT 0.5
	LT 0.5
1.2 Dichlorsbenzene	LT 0.5
1.4 Dichlorobensone	LT 0.2
1.2 Dichloroethane	27 0.05
1.1 Dichlorsethylene	LT 0.05
2,4 Digitrotoluene	LT 0.5
Eaxachiorobessene	LT O.S
Retachlerobutadiene	LT 0.3.
Mexachioroethane	LT 0.5 -
Leoptanel .	LT 0.5
Hethylese Chloride	LT 0.0:
Methyl Ethyl Ketone	28 A A2
litrobenzane	LT 0.QS LT 0.5
Pestachiorophessi	LT 0.3
henel	LT_0.5
Pyridiae	(100)
1.1.2.2 Tetrachioroethane	
1.1.1.2 Tetrachloroethane	LT 0.05 LT 0.05
letrachiosoethylene	PERC (39)
2.3.4.6 Tetrachiorophenol	LT 0.5
Coluene	9.5
1.1.1 Trichloroethane	0.18
1.1.2 Trichloroethane	0.15 - LT 0.05
Trichloroethylene	0.11
2.4.5 Trichlorophenol	LT 0.5
2.4.6 Crichlorophenol	LT 0.5
Vinyl Chloride	UT 0.05

Antifraozo Wastos

Physical Proportios and TCLP Motuls Analysis, ppm

	Pa	ramolor	1)11	8 G	FP	۸s	0a	Cd	Cı	14)	H	បច	Λη
	110	g. Llutt	<2 01 > 10	(14	< 100		100		5	5	0.2	t	ñ
1.71)	Sili:												
-iv-	iii i		7.5	1.01	> 2(N)	< 0.05	< 0.0	< 0.03	< 0.05	0.3	< 0.01	< (1.0%	< 0.05
W	1:1,		n	1.13	> 200	< 0.03	0.3	< 0.05	< 0.03	< 0. f	< 0.01	< 0:05	< 0.05
IV	IVL		0.5	1.05	> 200	< 0.05	< 0.3	< 0.05	< 0.05	0.2	< 0.01	< 0.05	< 0.05

TCLP Somi Volnillos Anniyais, ppm

	l'aramatar	crosol ·	2.4-11N1	CiG-limiz C	lud-C1-01	CIG-elli	nkrobonz C	ls-phonol	pyrklino	2.4.6-TCI	2.4.6-TCP	
	Hay, Limit	200	0.13	0.13	0.5	3	2	100	· <u> </u>	400	2	
TÀIT.	Šiii:						Y					
Tiv	้าเบ	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.2	< 0.2	< 0:04	< 0.04	
IV	fil.	0.2	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	< 0.33	< 0.35	< 0.07	< 0.07	
W	W.	< 0:05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.25	< 0.25	< 0.05	< 0.05	

TCLP Volatiles Analysis, ppm

	l'aramolar Nog. Limit	tronzona 0.5	CC14 0.5	Cibonz 100	C C 3 6	1.4-DCIU 7.5	1.2-DCA 0.5	1.1-DCE 0.7	200 MEIC	PCE 0.7	1Cf: 0.5	VChlorklo 0.2
TAIL	SILE											
-IV	iii)	• 0.10	< 0.10	< 0.10	< 0.10	< 0,10	< 0.10	< 0.10	< 2.0	0,13	0,97	< 0.70
IV	11.	0.32	< 0.10	< 0.40	< 0.10	< 0.10	< 0.10	< 0.10	< 2.0	0.12	< 0.10	< 0.20
11	IVI.	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 2.0	0.51	< 0.10	< 0.10

PROJECT: 815

PART V

HEALTH AND SAFETY PLAN

RCRA FACILITY INVESTIGATION
PHASE I RELEASE ASSESSMENT WORKPLAN
DOLTON RECYCLE CENTER



TriHydro Corporation

920 Sheridan Street Laramie, Wyoming 82070

(307) 745-7474 FAX: (307) 745-7729 I certify that I have read and understand the contents of this "Health and Safety Plan" for the RCRA Facility Investigation, Phase I Release Assessment Workplan at the Dolton Recycle Center in Dolton, Illinois.

Name	· .		
Company			
Date			

Note: To be reviewed and signed at beginning of sampling event.

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CHAPTER V-1

INTRODUCTION

This document describes the health and safety procedures for the RFI Phase I soil sampling program at the Dolton Recycle Center in Dolton, Illinois.

S-K has owned and operated the facility since March 1987. The Dolton Recycle Center occupies a 30-acre site in an industrialized area about 20 miles south of downtown Chicago, Illinois (Figure V-1-1). The address of the facility is:

Safety-Kleen Corp. 633 East 138th Street Dolton, IL 60419

The Dolton Recycle Center is a reclamation and recycling facility that accepts organic chemicals and solvent wastes from S-K service centers and other recycle centers, and industrial and commercial facilities. Spent materials brought to the facility are regenerated into product or blended for use as a fuel in cement kilns. Principal wastes managed at the facility are paint waste, lacquer thinner, mineral spirits, and waste oil.

All TriHydro Corporation personnel will follow this plan. Each field team member working on this project will maintain a general responsibility to identify and correct any health and safety hazards and to cooperate toward working as safely as possible.

Supporting Health and Safety Documents

In addition to the health and safety procedures specified in this document, TriHydro Corporation personnel and subcontractor employees will comply with all S-K health and safety procedures. Project work will also comply with applicable sections of the Federal Occupational Health and Safety Codes.

A copy of S-K's health, safety, and environmental policy is included as Appendix V-A. S-K Material Safety Data Sheets (MSDS) for the materials of interest at this site are included in Appendix V-B.

Analytical results from previous soil boring and sampling investigations at the facility are summarized in Table V-1-1. Analytical results from previous ground-water sampling

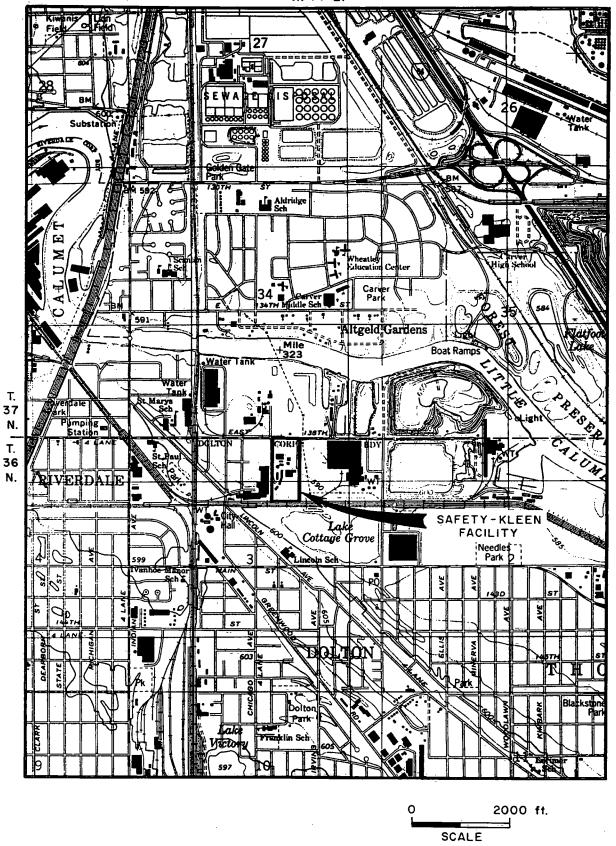


FIGURE V-1-1 :VICINITY MAP, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (ILD980613913)

V-1-2

Table V-1-1. Soil Quality, Dolton Recycle Center.

		Volatile Organic Compounds (mg/kg)												
				Methyl Ethyl	Methyl Isobutyl	Methylene		1,1,2- Trichloro-	Trichloro-	Xylenes,				
Location	Acetone	Benzene	Ethylbenzene	Ketone	Ketone	Chloride	Toluene	ethane	ethene	Total	All Others			
Plant Site*														
88-1(2.5)	7.4	ND	10	6	4.2	0.25	65	0.44	ND	95	ND			
88-2(2.5)	2.2	0.41	48	1.2	9.9	ŅD	680	ND	5.3	1400	ND			
88-2(5)	2.5	ND	11	2.1	20	ND	110	ND	ND	28	ND			
88-2(7.5)	ND	ND	0.32	ND	ND	ND	0.43	ND	ND	1.1	ND			
88-2(10)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
88-4(2.5)	5.6	0.024	1.5	0.74	3.6	0.11	58	ND	ND	22	ND			
88-5(2.5)	1400	ND	57	1.6	12	ND	390	ND	ND	290	ND			
88-6D(2.5)	ND	ND	ND	ND	ND	ND	0.045	ND	ND	ND	ND			
Precision Aire	Site				•									
90-B-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
90-B-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
90-HA-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
90-HA-2B	ND	ND	ND	ND	ND	ND	'ND	ND	ND	ND	ND			
90-HA-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
90-HA-4	ND	ND	ND	NĐ	ND	ND	ND	ND	ND	ND	ND			
Precision Aire	Site - 10,00	00-Gallon US	T Excavation											
91-10-B	••	ND	ND				ND		••	ND				
91-10-EW		ND	ND				ND		••	0.005				
91-10-NW		ND	ND				ND			ND				
91-10-SW		ND	ND				ND			ND				
91-10-WW		ND	ND			••	ND			ND				
Precision Aire	site - 15,00	00-Gallon US	T Excavation											
91-15-B		ND	ND				ND			ND				
9:1-15-EW		ND	ND				ND			ND				
91-15-NW		ND	ND				ND			ND				
91-15-SW		ND	ND				ND			ND	••			
91-15-WW		ND	ND	••			ND	••	••	ND				

⁴ Depth below ground surface (in feet) shown in location designation.

Table V-1-1. Soil Quality, Dolton Recycle Center (continued).

Location			Metals (mg/kg)									
	TRPH (mg/kg)		PCB (mg/kg)	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	
Plant Site*												
88-1(2.5)	••		9	40	0.5	1.2	5.7	0.4	1	0.5		
88-2(2.5)		••	9.3	41	0.5	1.3	9.5	0.4	1	0.5		
88-4(2.5)			7.8	44	0.6	12	26	0.4	1	0.5		
88-5(2.5)			8	47	0.6	1.4	13	0.4	1	0.5		
88-6D(2.5)	••		6.7	28	0.5	7.9	3.4	0.4	1 .	0.5		
Precision Aire	Site											
90-B-1	270	ND										
90-B-3	ND	ND		••			•-					
90-HA-1	ND	ND					••	·				
90-HA-2B	1410	ND										
90-HA-3	810	ND				••	••					
90-HA-4	ND	ND								••		

^a Depth below ground surface (in feet) shown in location designation.

investigations are summarized in Table V-1-2. A list of chemicals which may be associated with recycle centers are presented in Table V-1-3. The present soil boring investigation will be conducted in the vicinity of the previous investigations. Field team personnel may be exposed to the compounds listed in tables V-1-1 through V-1-3.

Project Description

This project is the Dolton Recycle Center RCRA Facility Investigation - Phase I Release Assessment, which is to be conducted by TriHydro Corporation. The site activities will involve the collection of soil and ground-water samples at solid waste management units (SWMUs), areas of concern (AOCs), and background sites. The locations of the SWMUs are shown on Figure V-1-2. The SWMUs have been used to store, transfer, contain, treat, and/or dispose of used oil, spent mineral spirits, spent immersion cleaner, antifreeze, paint wastes, lacquer thinner, and dry cleaning wastes.

Personnel Responsibilities

Project	personnel who will	have	responsibility	for	the
operation of	this project are:				

Project Manager: John	n Ahern, TriHydro Corporation										
Site Manager: Tom Ni	ssen, TriHydro Corporation										
Health and Safety Con	tacts: John Ahern/John Schneider, TriHydro Corporation										
Field Team Members: _	Field Team Members:										
_											
_											
_											
	,										

Table V-1-2. Ground-Water Quality, Safety-Kleen Corp. Recycle Center, Dolton, Illinois.

									Volatile	Organic (Compounds	(mg/L)							
					trans-1,2-	1,1-	1,1-			Methyl	Methyl				1,1,1-				
				Chloro-	Dichloro-	Dichloro-	Dichloro-	Ethyl-		Ethyl	Isobutyl		Tetrachloro-		Trichloro-	Trichloro-	Vinyl	Xylenes,	
Well	Date	Acetone	Benzene	ethane	ethene	ethane	athene	benzene	2-Hexanona	Ketone	Ketone	Chloride	ethene	Toluene	ethane	ethene	Acetate	Total	All Others
SK-1	10-88	ND	0.005	0.2	0.023	0.012	0:008	ND	ND	ND	ND	0.014	0.059	ND	0.038	0.011	0.019	0.012	ND
SK-2	10-88	16(B)	0.055	ND	ND	ND	ND	0.31	ND	6.8	12	0.18	ND	8.7	ND	0.053	ND	1.8	ND
SK-3	10-88	3(B)	ND	ND	ND	ND	ND	ND	ND	0.82	0.37	ND	ND	0,32	ND	0.058	ND	0.054	ND
SK-4	10-88	16(B)	0.02	ND	ND	ND	ND	ND	0.018	1.4	1.8	1.6	ND	0.77	ND	ND	ND	0.81	ND
SK-5	10-88	130(B)	ND	ND	ND	ND	ND	ND	ND	11	64	ND	ND	230	ND	ND	ND	7.3	ND
SK-6	10-88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SK-6D	10-88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SK-7D	10-88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SK-9	10-88	ND	ND	ND	ND	ND	ND	ND	NĐ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SK-10	10-88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	10-83					••		••	••			•-	••		ND		••	••	••
	11-83	••	••		-		, 		••		••			••	ND	••			••
2	10-83	••		••			••						••		ND	••	••		••
	11-83	••	••	••	••	••	••	••	••		••	••	••		ND	••	••		•-
3	10-83		••	••		••			••	••			••		0.016	••		••	
	11-83		••		••		••				••	••	••	••	0.018				-
4	10-83					_						••			0.06		••		
	11-83	••					••				••				0.04	_			
6	10-83	••					••		••	••	•-			••	0.001		••	••	
	11-83	••					••		••		••	••		••	ND		••	••	
8D	10-83			••		••	•-						••	••	ND			••	
	11-83	••		••	••		•-		••		••	••		••	ND		••		••
	10-88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	10-83				••				••		••				ND		••		
	11-83			••			••		••		••	••	••	••	ND		••	••	-
12A	10-83		••			••			••				••		1.2		••	••	
	11-83	••			••		••	••	••			••	••	••	0.79	••		••	
13	10-83	••	••		••		••		••	••		••	••		ND	••	••		
	11-83			••	••				••		••	••	•-	••	ND	••	••	••	••
14	10-83	••		••			••		••			••		••	ND	••	•-	••	**
	11-83			••			••		••		••			••	ND	••	••	••	••
15	10-83			••	**				••	••	••	••		••	ND	**			
	11-83		••			••		••			••	••	••	••	ND	••	••	••	••
16	10-83	••	••		••		••		•-	•	••	••			ND	••	••	••	-
	11-83	••			••	••	••		••		••			••	ND		••	••	••
17	10.00														ND				
17	10-83 11-83	;-				••	**	••				••	 	-	ND ND		-	••	
	11-83					••		••		••	••	••	••		MD	••		••	

Note:
"B" means constituent detected in blank(s)

Table V-1-2. Ground-Water Quality, Safety-Kleen Corp. Recycle Center, Dolton, Illinois (continued).

			Total Matals (mg/L)									
		TPH										
Well	Date	(ppb)	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver		
SK-1	10-88		ND	ND	ND	ND	ND	ND	ND	ND		
SK-2	10-88		ND	ND	0.01	ND	ND	NĎ	ND	ND		
SK-3	10-88	ND		••				••	••			

- Table V-1-3. Chemicals Which May Be Associated With Recycle Centers.
- 1. Chemicals Possibly Associated with Spent Mineral Spirits and Sludge.

<u>Volatile Organics</u> Semi-Volatile Organics Chlorobenzene Cresylic Acid Chloroethane Naphthalene Phenols Chloroform Chloromethane 1,2-Dichlorobenzene 1,4-Dichlorobenzene Parts Cleaner Solvent 1,1-Dichloroethane 1,2-Dichloroethane Mineral Spirits 1,1-Dichloroethene Petroleum Naphtha Trans-1,2-Dichloroethene Stoddard Solvent Cis-1,3-Dichloropropene Ethylbenzene Methylene Chloride <u>Inorganic - Metals</u> Tetrachloroethane 1,1,1-Trichloroethane Antimony Copper Trichloroethene Arsenic Lead* Toluene Barium Mercury

2. Chemicals Associated with Other Product and Spent Solvents

Constituents

Vinyl Chloride

Xylenes

Products and Spent Solvents

Nickel

Silver

Tin Zinc

Ortho-di-chlorobenzene
Cresylic Acids
Methylene Chloride
Perchloroethylene
Petroleum Sulfonate
Triethanolamine

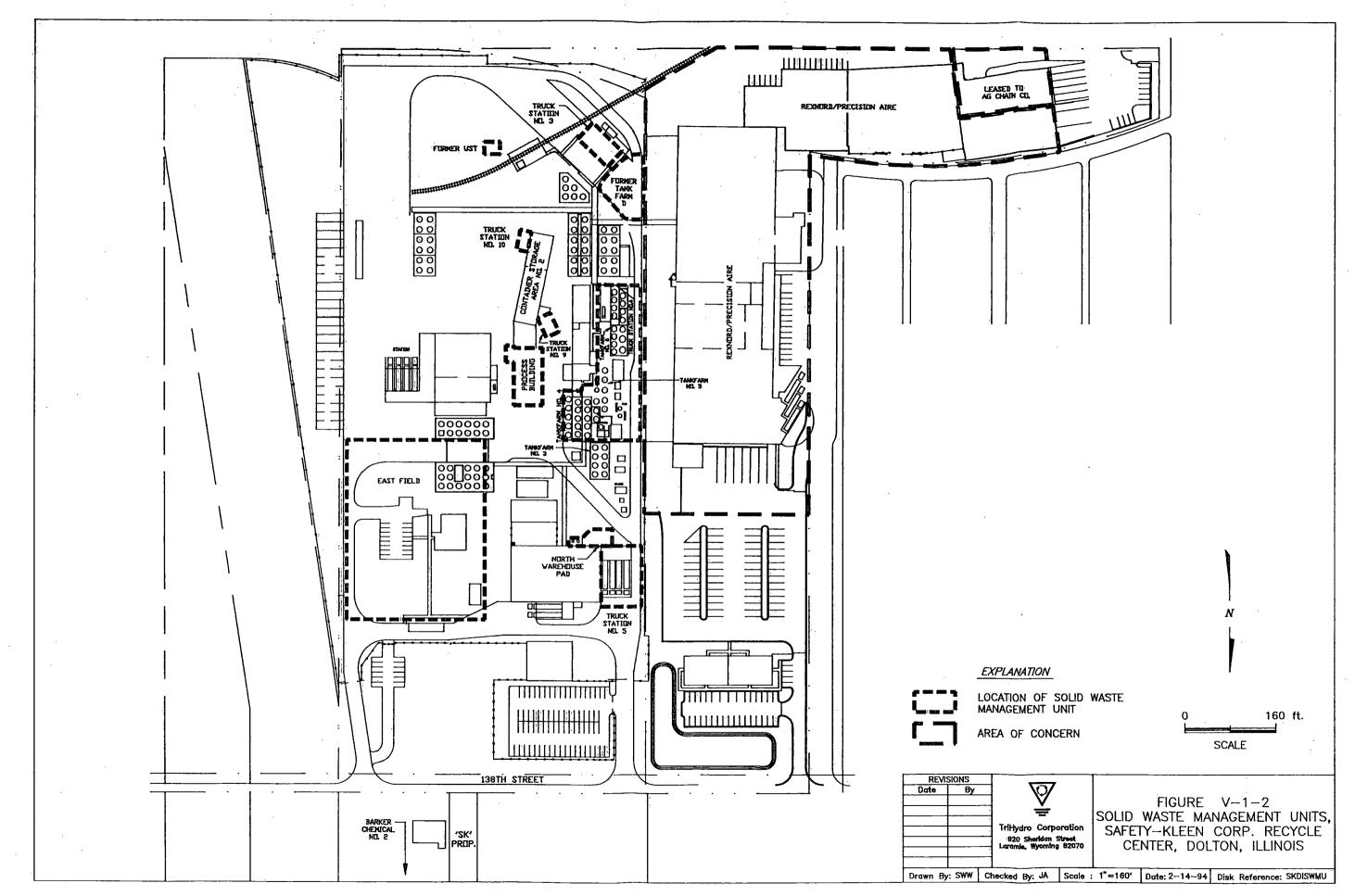
Carburetor Cleaner Dry Cleaning Solvent Immersion Cleaner Mineral Spirits Waste Paint Thinner

Cadmium*

Chromium*

Cobalt

* Spent solvent or sludge may exhibit characteristic of EP Toxicity.



Field personnel will be required to have successfully completed health and safety training prior to any soil sampling. TriHydro Corporation personnel have completed the OSHA 40-hour and OSHA 8-hour supervisors training as specified by 29 CFR 1910.120.

TriHydro Project Manager

It is the responsibility of the Project Manager to ensure that the field team has access to this plan and reads the safety procedures. It is the individual's responsibility to bring to the attention of the Project Manager any portion of this plan and related training that he/she does not fully understand. The specific responsibilities of the Project Manager with respect to safety are to:

- Provide initial safety training for all project team personnel;
- Assure all TriHydro field team personnel have read and understand the Health and Safety Plan; and
- Make available to the field team personnel the data known to him on the chemical contaminants in the soils.

TriHydro Site Manager

Prior to beginning site work, the Site Manager will hold a meeting of the field team personnel at the Dolton, Illinois, facility to discuss the contents of this plan. The objective of this meeting is to ensure that all field team personnel are adequately informed in hazard evaluation and safe work practices.

The specific responsibilities of the Site Manager with respect to safety are to:

- Assure that all work performed by TriHydro Corporation is conducted in accordance with safe practices outlined in this plan;
- Coordinate with TriHydro field team personnel for firewatch, traffic control and security services at work sites;
- Provide applicable health and safety monitoring equipment;
- Monitor activities to ensure the proper use of personal protective equipment specified in this

plan, such as dust protection masks, respirators, protective coveralls, gloves, safety boots, protective eyewear, ear plugs, and hard hats;

- Assure effective workplace surveillance for hydrocarbon vapors is maintained and evaluate the results of surveillance;
- Ensure safety equipment for use by field team personnel is maintained in a usable condition;
- Initiate emergency phone calls when an emergency or accident requires medical attention; and
- Shut down or modify field work activity based on criteria presented in Chapter V-3.

Field Team Members

The responsibilities of field team members with respect to safety are to:

- Read, understand, and follow this plan or respective companies' plan;
- Perform work safely;
- Cooperate with safety personnel;
- Report any unsafe conditions to the TriHydro Site Manager;
- Be aware and alert for signs and symptoms of potential exposure to site contaminants and climatic or acoustic stress.

CHAPTER V-2

HAZARD EVALUATION

The activities expected to be conducted during this project are the following:

- 1. Cutting and removal of concrete or asphalt;
- Sampling of soils to a depth of up to 35 feet below ground surface;
- Monitoring of combustible gas and total organic vapor concentrations in breathing space and on soil samples; and
- 4. Collection of soil samples, preparation and shipment to lab.

Field team personnel will be exposed to the general types of hazards described below during the conduct of these activities.

Physical Hazards

Field team personnel may be exposed to physical hazards around vehicles and field equipment. The physical hazards include:

- Cuts and contusions by being struck by swinging objects, concrete chips during concrete cutting, and falling objects; and
- 2. Muscular injury by overexertion or improper movement (e.g. back injury due to improper lifting).

Electrical Hazards

Field team personnel may be exposed to electrical hazards. The electrical hazards include digging into buried cables.

Fire/Explosion Hazards

Field team personnel may be exposed to fire/explosion hazards during all activities. The fire/explosion hazards include:

- 1. Digging into underground pipelines carrying liquid petroleum hydrocarbons and natural gas;
- 2. Sparking of combustible petroleum hydrocarbons in the air, in soil gas, on soils, and on the ground water; and
- 3. Equipment fires.

Chemical Hazards

Field team personnel may be exposed to chemical hazards during all activities. A list of products which may be associated with operations at the Dolton Recycle Center is included in Appendix V-B. Constituents found in soils to date are listed in Table V-1-1, and constituents found in ground-water to date are listed in Table V-1-2. The chemical hazards include:

- 1. Petroleum hydrocarbon liquids and vapors;
- Paint wastes; and
- 3. Toxic and carcinogenic inorganic and organic compounds.

The likely exposure pathways are inhalation, ingestion, and skin contact. The petroleum hydrocarbon liquids will likely be used oil, spent mineral spirits or immersion cleaner, dry cleaning wastes, and waste antifreeze. These liquids and paint waste may contain toxic and carcinogenic inorganic and organic compounds.

Climatic Stress

Field team personnel may be exposed to climatic stress due to temperature extremes and high winds during all outside activities. In addition to climatic stress, high temperatures will increase the volatility of some toxic and carcinogenic compounds (thereby increasing the potential for inhalation). High wind will increase the potential for physical and chemical hazards by blowing objects around and creating airborne particulates, mists, and spills.

Acoustical Hazards

Field team personnel may be exposed to excessive noise created during concrete cutting, sampling, or by unrelated operations at the Dolton Recycle Center.

CHAPTER V-3

SAFE WORK PRACTICES

The following sections present procedures on how to address safely the hazards expected to be encountered in the different activities of this project. Based on the work to be performed and the type of chemical hazards that may be encountered, EPA Level D personal protection has been determined to be adequately protective. Not all tasks require Level D protection; however, these determinations will be made by the Site Manager, and modifications to work practices and the required level of personal protection will be specified to the field team personnel by the Site Manager.

Work Zone Access

During concrete cutting and sampling operations, a 10-foot radius work zone around the excavation will be established. Only authorized personnel will be permitted to enter this work zone. Authorized personnel will include those who have duties requiring their presence in the work zone and have received appropriate health and safety training. The Site Manager has the right to require the exit of any person from the work zone.

Personal Protective Equipment

The personal protective equipment requirements are summarized in Table V-3-1. The equipment is described in more detail below.

Respiratory Protection: all field team personnel will have a half-face or full-face air purifying respirator with organic vapor cartridges with particulate prefilter available for use.

<u>Protective Clothing</u>: all field team personnel who handle contaminated soils, liquids, or auger flights, will have Tyvek coveralls (or equivalent) available for use.

<u>Hand Protection</u>: all field team personnel who handle contaminated soils, liquids, or auger flights, will wear butyl rubber or nitrile gloves. Wearing disposable PVC gloves under

Table V-3-1. Personal Protective Equipment Requirements.

Task	Personnel	Dust Protection Mask	Respirator	Tyvek Coveralls	Chemically Resistant Gloves	Chemically Resistant Boots	Safety Glasses	Splash Goggles	Ear Plugs/ Muffs	Safety Helmet
Concrete Cutting	Sampling Team	Available for use	Available for use	Available for use	Available for use	No	Yes	No	Yes	Yes
Soil Sampling	Sampling Team	Yes	Available for use	Yes ^{1,2}	Yes	Yes ¹	Yes	Available for use	Available for use	Yes
Sample Handling	Sampling Team	Available for use	Available for use	Available for use	Available for use	Available for use	Yes	Available for use	Available for use	Yes
Decontamination Operations	Sampling Team	Available for use	Available for use	Yes ^{1,2}	Yes	Yes ¹	Yes	Available for use	Available for use	Yes

¹Not required if soil or water is not visibly contaminated, and if PID measurements of the soil samples are below 1000 ppm.

²Coveralls are to be taped to gloves and boots to minimize exposure pathways to contaminants.

butyl gloves will provide added protection when handling heavily contaminated material.

Foot Protection: field team personnel will wear neoprene (or equivalent) rubber boots (either with steel toes and shanks or over substantial shoes) when liquids are expected to be encountered. Under non-liquid exposure conditions, substantial shoes are permissible. The boots will be taped to the leg of Tyvek suits.

Eye Protection: field team personnel will wear impact-resistant safety glasses with attached side shield. Where splashes may occur of water which is visibly contaminated with free-floating hydrocarbon or which has moderate to strong odors, splash goggles will be required.

<u>Ear Protection</u>: field team personnel will be required to wear hearing protection devices (ear plugs or muffs) if involved in concrete cutting and if they complain of ear ringing or temporary hearing loss.

<u>Safety Helmet</u>: field team personnel will wear an OSHA-approved hard hat in the outside environment.

Hazard Protection

The following potential hazards were described in the previous section of this plan:

- 1. Physical Hazards
- Electrical Hazards
- 3. Fire/Explosion Hazards
- 4. Chemical Hazards
- 5. Climatic Stress
- 6. Acoustical Hazards

Procedures to address safely each of these hazards are described below.

Physical Hazards

The personal protective equipment is designed to protect the field team personnel from most physical hazards expected at the work site. However, the field team personnel should be aware of the potential physical hazards (see Chapter V-2), and remain alert during field work. The following procedures will be implemented to minimize the potential for injury from physical hazards:

- 1. Keep all support vehicles and unnecessary equipment outside of the work zone; and
- 2. Store and secure all equipment in the work zone until use is required.

Electrical Hazards

The potential exists for field team personnel to encounter electrical hazards. The following procedures will be implemented to minimize the potential for injury from electrical hazards:

- 1. Before digging commences at each location, obtain assurance from appropriate personnel that belowground lines are absent at that location to the best of their knowledge;
- 2. During digging, proceed slowly; and
- 3. Stop digging if any resistance is encountered.

Fire/Explosion Hazards

The potential exists for field team personnel to encounter fire/explosion hazards during concrete cutting and soil sampling. Due to the flammable nature of the hydrocarbons, possible ignition sources will be kept out of the work zone:

- 1. Matches and lighters are not allowed in the work zone; and
- Internal combustion engines must not be operated in the work zone while hydrocarbon-contaminated solids or liquids might be brought to the surface; alternatively, they must be equipped with spark arrestors.

The following additional precautions will be implemented to minimize the potential for fire or explosion:

 Digging will proceed slowly to minimize damage to any underground lines;

- 2. Combustible gas measurements will be taken in the excavation at a minimum at the start and completion of digging;
- 3. If combustible gas measurements equal or exceed 100% LEL, the field team personnel will inject nitrogen gas into the excavation;
- 4. If fire, smoke, or heat emanate from the excavation, the field team personnel will inject nitrogen gas into the excavation; work will not recommence until the possibility for fire or explosion has abated; and
- 5. If total organic vapors exceed 1000 ppm or 30% LEL in the atmosphere of the work zone (see Chapter V-5 for monitoring procedures), the Site Manager will instruct the field team personnel to stop work and move upwind, and methods will be implemented to subdue potentially combustible vapor emissions (such as sprinkling soil piles or use of a nitrogen gas purge).

Chemical Hazards

The following chemical hazards may be encountered at the work site:

1. Hazardous organic and inorganic chemicals (see tables V-1-1 through V-1-3, and Appendix V-B), which may adversely affect human health through skin contact and inhalation.

The following procedures will be implemented to minimize potential harm from hazardous organic chemicals:

- 1. Work will begin in EPA Level D personal protection;
- The protection levels at the work site will be upgraded in accordance with the responses to hydrocarbon vapor concentrations listed in Table V-3-2 (see Chapter V-5 for monitoring procedures); and
- 3. The Site Project Manager will refer to the NIOSH/OSHA Pocket Guide to Chemical Hazards for the proper response to hazardous organic and inorganic chemicals if field team personnel complain of irritation, giddiness, headache, or nausea, or other symptoms of chemical exposure.

Table V-3-2. Organic Vapor Criteria, As Determined by Photoionization Detector, and Personnel Protection Responses.

Concentrations	Response			
<20 ppmv Organic Vapor (OV)	Limited hazard, no special action.			
20-100 ppmv OV	Workers alerted to be conscious of symptoms such as headache, nausea, etc.			
100-500 ppmv OV	Half-mask CV Respirators worn by all in work area. Collect and analyze samples for constituents of concern with detector tubes every 30 minutes.			
>500 ppmv OV	Work stops; procedures taken to subdue excessive vapor levels (such as sprinkling cuttings with water or use of nitrogen gas flush).			
	→ 4 - **			

Note: Organic vapor (OV) measurements are to be taken in the breathing space within the work zone.

Organic vapor concentrations measured with a hand-held photoionization detector (PID) which is appropriately calibrated at the beginning of each day and as needed throughout the project.

The threshold concentrations are based on the Exposure Limits contained in the NIOSH/OSHA

Pocket Guide to Chemical Hazards for Stoddard solvent which is chemically similar to Mineral Spirits. Mineral Spirits will be as volatile or more volatile than the used oil and re-refined petroleum products expected to be encountered during sampling.

Climatic Stress

During day-to-day field work, the Site Manager will be alert for the signs and symptoms of climatic stress.

Field team members will be observed for the following signs and symptoms of climatic stress:

- Profuse sweating;
- Skin color change;
- Shivering;
- Disorientation or slurring of speech; and/or
- Vision problems.

Any team member who exhibits any of these signs or symptoms will be removed immediately from field work. If it is heat stress, the team member will be requested to consume electrolyte fluid or cool water while resting in a shaded area after removing impervious clothing. If it is cold stress, the team member will be requested to move into a heated area. The individual will be instructed to rest until the symptoms are no longer recognizable. If the symptoms appear critical, persist or get worse, immediate medical attention will be sought.

Acoustical Hazards

When working around concrete cutting equipment, the potential exists for exposure to excessive noise. Therefore, team members involved in concrete cutting will be required to use hearing protection equipment.

Some unrelated operations and activities at the Pekin facility may generate excessive noise. Any team member who complains of ringing in the ears or temporary hearing loss will be required to use hearing protective equipment.

Field team personnel are not allowed to use Walkmans or similar radios and tape decks.

Decontamination Procedures

Contact with hazardous organic chemicals is possible in the work zone. The following decontamination procedures will be implemented to minimize the movement of contaminants outside the work zone and to minimize the period of contact with these contaminants.

Personal Hygiene

Field team personnel should conduct the following to ensure that contaminants will not remain in contact with their bodies:

- 1. All field personnel involved in sampling activities are instructed to wash their hands, face, neck and forearms at the end of the workday. The Site Manager will provide soap, water, and towels at the drilling site for this purpose;
- 2. All field personnel are instructed to take a full-body shower at home or hotel at the end of the workday; particular attention should be paid to areas of the body that are typically overlooked, such as behind the ears or between the toes;
- 3. No eating, drinking or smoking will be permitted in the work zone;
- 4. Tyvek suits, disposable ear plugs, and respirator cartridges will be discarded in garbage bags and then placed in trash bins after each day of use; and
- 5. Other personal protective equipment (see Table V-3-1) will be washed in warm or hot soapy water after each day of use.

Equipment Decontamination

Sampling equipment which has come in contact with contaminants will be cleaned before reuse at another location and at the end of each day. Decontamination will be a warm soapy water wash, tap water rinse, and distilled or deionized water rinse.

CHAPTER V-4

EMERGENCY RESPONSE

Emergency response shall be carried out immediately whenever there is a personal injury, fire, explosion, or release of hazardous waste or hazardous constituents which could threaten human health and the environment. Any field team member that sights or suspects a fire, explosion, or release of hydrocarbons, chemicals, hazardous waste, or hazardous constituents shall notify the TriHydro Site Manager immediately.

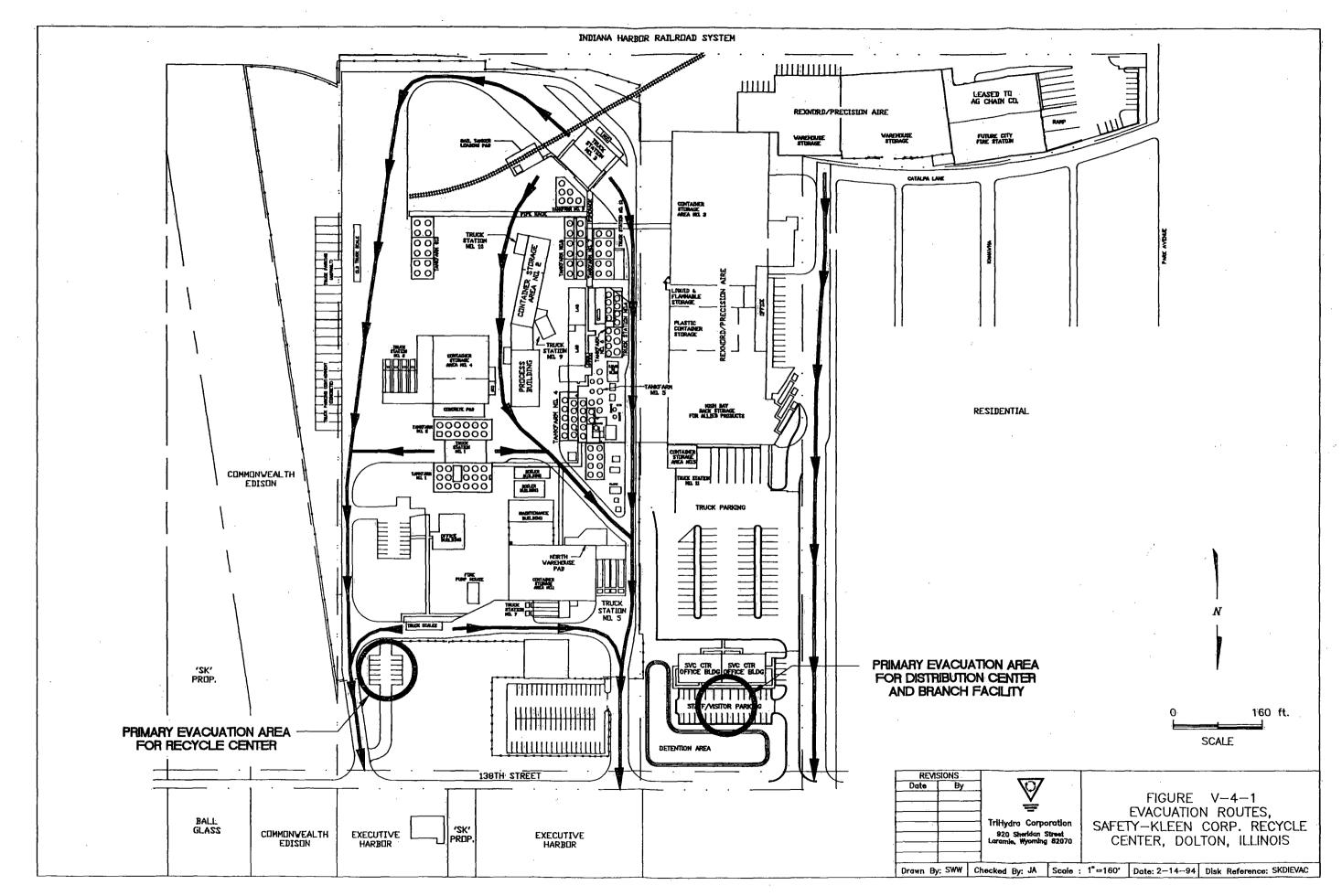
The primary and alternate evacuation routes are shown on Figure V-4-1. The facility evacuation alarm system will be used to notify personnel in all areas of the plant. The primary assembly area is at the recycle center visitors parking lot; the second assembly area is at the service center visitors parking lot. The Site Manager will account for all project personnel in the assembly area.

The site is equipped with an onsite communication system and telephones for access to offsite. Alarm systems for certain equipment, areas, and storage tanks are maintained. Emergency numbers are posted for quick response to an emergency.

Fire and spill response and other safety equipment is located across the site. The facility is equipped with a foam and water fire suppressant system. Portable fire extinguishers are placed, marked, and maintained at key locations. Spill and first aid stations on the site provide centralized access to tools, supplies, and equipment for efficient emergency response. Emergency showers and eye wash stations are located in various process buildings and storage areas.

The following information is provided in the event of an emergency:

Emergency Service Organization	<u>Te</u>	lephone
Fire Department		911
Ambulance		911
Police Department		911
Roseland Hospital, 45 West 111th Street, Chicago, Illinois 60628	3	12-995-3000



These emergency service organizations will provide emergency medical care for injuries and toxicological problems.

The appropriate chain of communication for an emergency situation will be discussed during the onsite safety meeting before any work begins. A map showing the route from the facility to the hospital is shown on Figure V-4-2.



CHAPTER V-5

MONITORING PROCEDURES

The monitoring procedures are divided into a medical monitoring program and a field monitoring program. Each is described below. Under the field monitoring program, each piece of monitoring equipment is described.

Medical Monitoring Program

Site sampling work will involve active physical work and potential exposure to petroleum hydrocarbons and other chemicals, climatic stress, noise and physical safety hazards common to field operations. The work will require people of reasonable health with normal vision and hearing acuity. TriHydro Corporation will have documentation of employee medical fitness to perform the required work, evidenced by a signed document from the examining physician dated no later than one year prior to start-up of the project. This documentation will also indicate the employee's ability to perform the required work while wearing a dust protection mask or an air-purifying respirator.

Field Monitoring Program

Personal exposure to combustible gas, organic vapors, and contaminants will be monitored to insure that personal exposures do not exceed acceptable limits and that appropriate selection of protective equipment is made. The safety instrumentation to be used in the field include a combustible gas meter and an organic vapor meter. The Site Manager will be knowledgeable in the operation of each instrument.

Combustible Gas Meter

A combustible gas meter will be taken into the field to collect combustible soil gas data and to provide backup to the PID (one instrument per work zone). Each instrument will be calibrated at the beginning of each day with a pentane standard calibration gas. The instrument will be used to measure combustible gas concentrations at breathing zone locations within the work zone and in the sampling excavation.

The combustible gas meter measurements will identify conditions for fire/explosion control and site evacuation. These conditions are described in Chapter V-3 under the section entitled "Fire/Explosion Hazards."

Photoionization Detector

A photoionization detector (PID) will be taken into the field and operated during the project (one instrument per work zone). Each instrument will be calibrated at the beginning of each day with an isobutylene standard calibration gas. The instrument will be used to measure hydrocarbon vapor concentrations at breathing zone locations within the work zone (also downwind of the work zone if necessary).

The PID measurements will identify conditions for respirator use and site evacuation. These conditions are described in Chapter V-3 under the sections entitled "Fire/Explosion Hazards" and "Chemical Hazards."

CHAPTER V-6

RECORDKEEPING

The following documents and records will be maintained in the TriHydro Corporation project files:

- 1. A copy of this plan;
- Documentation of employee's medical ability to perform work and wear respirators;
- 3. Health and safety training certification forms;
- 4. Respiratory training certification;
- 5. Field notes and field data pertaining to enforcement of health and safety practices; and
- 6. Accident and illness reports.

CHAPTER V-7

SAFETY EQUIPMENT LIST

The following documents and materials will be made available at the Dolton Recycle Center by the TriHydro Site Manager. The Site Manager will ensure that all these documents and materials are at the site before sampling commences. He will also ensure that the instrumentation is in working order before work begins.

Supporting Documentation

NIOSH/OSHA Pocket Guide to Chemical Hazards
S-K Health, Safety, and Environmental Policy (Appendix V-A)
S-K Material Safety Data Sheets (Appendix V-B)

Instrumentation

Combustible gas meter and calibration gas (one per work zone)
Organic vapor meter and calibration gas (one per work zone)
Chemical (benzene) detector tubes and pump pH meter and buffers or pH indicator paper

Personal Protective Equipment

Dust protection masks
Respirators with organic vapor cartridges, acid mist
cartridges, and particulate pre-filters
Tyvek coveralls
Chemically resistant gloves
Neoprene safety boots
Safety glasses
Splash goggles
Disposable ear plugs
Hard hats

Equipment

Fire extinguisher (type ABC) (one per work zone)
Nitrogen cylinder, regulator, and hose (one per work zone)

<u>Supplies</u>

Distilled water Water First aid kit
Tape Towels
Soap Brush

CHAPTER VI-8

REFERENCES

U.S. Department of Health and Human Services, 1990, NIOSH Pocket Guide to Chemical Hazards, June 1990.



PART II

NATURE AND EXTENT OF IMPACTS

RCRA FACILITY INVESTIGATION
PHASE I RELEASE ASSESSMENT WORKPLAN
PEKIN, ILLINOIS SERVICE CENTER



TriHydro Corporation

920 Sheridan Street Laramie, Wyoming 82070

(307) 745-7474 FAX: (307) 745-7729



November 8, 1988

Solid & Hazardous Waste Site Assessments
Remedial Design & Construction
Underground Tank Management
Asbestos Surveys & Analysis
Hydrogeologic Investigations & Monitoring
Analytical Testing / Chemistry
Industrial Hygiene / Hazard Communication
Environmental Audits & Permitting
Exploratory Drilling & Monitoring Wells

Mr. John McBride ATEC Environmental Services 1501 E. Main Street Griffith, IN 46319

Re: Ten Water VOA: U.S. EPA Method 624

Two Water RCRA Metals

One Water Total Hydrocarbon

SW 846 Method 8015 Revised, 7000 Series

Safety Kleen

ATEC Project Number 52-83217

Dear Mr. McBride:

Enclosed are the results of the Chemical Analyses for the ten water samples which were submitted to the ATEC Environmental/Analytical Testing Division on October 14 1988, on behalf of Safety Kleen. The volatile samples were analyzed on Finnigan Incos 50 and 1020 OWA GC/MS/DS systems, complete with Superincos Software, via U.S. EPA Method 624 for Purgeable Organic Compounds. Prior to analysis the system was tuned against Bromofluorobenzene and calibrated with the appropriate standard. Total Hydrocarbon analysis was performed on a Varian 3700 Gas Chromatograph using Flame Ionization Detection via SW 846 Method 8015 Revised. Metals were analyzed on a Varian SpectrAA-10 Atomic Absorption Spectrophotometer according to the 7000 series of the methods outlined in SW 846.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

Samples will be held for a period of thirty days following the date of this report, after which re-analysis will require the submission of fresh samples. It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted, ATEC Associates, Inc.

Keich S. Kline

Keith S. Kline Environmental/Analytical Testing Division Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: SK-I

Sample Matrix:

Water

Date Sample Collected: October 12, 1988
Date Sample Received: October 14, 1988
Date Sample Analyzed: October 25, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277A

1 of 2

Analyte	CAS Number	oncentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
-Chloroethane	75-00-3	200	10
_Methylene Chloride	75-09-2	14	5
Acetone	67-64-1	<10*	10
Carbon Disulfide	75-15-0	< 5	5
- 1,1-Dichloroethene	75-35-4	. 6	5
_ 1,1 Dichloroethane	75-35-3	12	5
- Trans-1,2-Dichloroethene	156-60-5	23	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
- 1,1,1-Trichloroethane	71-55-6	38	5
Carbon Tetrachloride	56-23-5	< 5	5
- Vinyl Acetate	108-05-4	19	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83277A

	Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
	Trans-1, 3-Dichloropropene	10061-02-6	< 5	5 .
_	Trichloroethene	79-01-6	11	5
	Dibromochloromethane	124-48-1	< 5	5
	1,1,2-Trichloroethane	79-00-5	< 5*	5
-	Benzene	71-43-2	5	5
	cis-1,3-Dichloropropene	10061-01-5	< 5	5
	2-Chloroethylvinylether	110-75-8	<10	10
	Bromoform	75-25-2	< 5	5
	4-Methyl-2-Pentanone	591-78-6	<10*	10
	2-Hexanone	108-10-1	<10	10
	Tetrachloroethene	127-18-4	59	5
	1,1,2,2-Tetrachloroethane	79-34-5	< 5	5 .
	Toluene	108-88-3	< 5*	5
	Chlorobenzene	108-90-7	< 5	5
	Ethylbenzene	100-41-4	< 5	5
	Styrene	100-42-5	< 5	5
_	Total Xylenes		12	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: J. Sima Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

Environmental/Analytical Testing Division

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification:

Sample Matrix:

Water

Date Sample Collected: Date Sample Received:

October 12, 1988

SK-2

October 14, 1988 October 25, 1988

Date Sample Analyzed:

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277B

1 of 2

•	·	oncentration	Quantitation
Analyte	CAS Number	(ug/L)	Limit (ug/L)
Chloromethane	74-87-3	<100	100
Bromomethane	74-83-9	<100	100
Vinyl Chloride	75-01-4	<100	100
Chloroethane	75 - 00-3	<100	100
Methylene Chloride	75-09-2	180	100
Acetone	67-64-1	15,000	100
Carbon Disulfide	75-15-0	< 50	50
1,1-Dichloroethene	75-35-4	< 50	50
1,1 Dichloroethane	75-35-3	< 50*	50
Trans-1,2-Dichloroethene	156-60-5	< 50*	50
Chloroform	67-66-3	< 50*	50
1,2-Dichloroethane	107-06-2	< 50*	50
2-Butanone	78-93-3	6,800	100
1,1,1-Trichloroethane	71-55-6	< 50.	50
Carbon Tetrachloride	56-23-5	< 50	50
Vinyl Acetate	108-05-4	<100	100
Bromodichloromethane	75-27-4	< 50	50
1,2-Dichloropropane	78-87-5	< 50	50

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83277B

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 50	50
Trichloroethene	79-01-6	53	50
Dibromochloromethane	124-48-1	< 50	50
1,1,2-Trichloroethane	79-00-5	< 50	50
Benzene	71-43-2	55	50
cis-1,3-Dichloropropene	10061-01-5	< 50	50
2-Chloroethylvinylether	110-75-8	<100	100
Bromoform	75-25-2	< 50	50
4-Methyl-2-Pentanone	591-78-6	12,000	100
2-Hexanone	108-10-1	<100*	100
Tetrachloroethene	127-18-4	< 50*	50
1,1,2,2-Tetrachloroethane	79-34-5	< 50	50
Toluene	108-88-3	8,700	50
Chlorobenzene	108-90-7	< 50	50
Ethylbenzene	100-41-4	310	50
Styrene	100-42-5	< 50	50
Total Xylenes		1,800	50

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: J. Sima Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

Environmental/Analytical Testing Division

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: SK-3

Sample Matrix:

Water

Date Sample Collected: Date Sample Received: October 14, 1988
Date Sample Analyzed: October 25, 1988 Date Sample Analyzed:

October 12, 1988

October 25, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277C

1 of 2

		oncentration	Quantitation
Analyte	CAS Number	(ug/L)	Limit (ug/L)
Chloromethane	74-87-3	<100	100
Bromomethane	74-83-9	<100	100
Vinyl Chloride	75-01-4	<100	100
Chloroethane	75-00-3	<100	100
Methylene Chloride	75-09-2	< 50*	50
Acetone	67-64-1	3,000	100
Carbon Disulfide	75-15-0	< 50	50
1,1-Dichloroethene	75-35-4	< 50	50
1,1 Dichloroethane	75-35-3	< 50	50
Trans-1,2-Dichloroethene	156-60-5	< 50*	50
Chloroform	67-66-3	< 50*	50
1,2-Dichloroethane	107-06-2	< 50	50
2-Butanone	78-93-3	820	100
1,1,1-Trichloroethane	71-55-6	< 50*	50
Carbon Tetrachloride	56-23-5	< 50	50
Vinyl Acetate	108-05-4	<100	100
Bromodichloromethane	75-27-4	< 50	50
1,2-Dichloropropane	78-87-5	< 50	50

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 83277C

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 50	50
Trichloroethene	79-01-6	58	50
Dibromochloromethane	124-48-1	< 50	50
1,1,2-Trichloroethane	79-00-5	< 50	50
Benzene	71-43-2	< 50*	50
cis-1,3-Dichloropropene	10061-01-5	< 50	50
2-Chloroethylvinylether	110-75-8	<100	100
Bromoform	75-25-2	< 50	50
4-Methyl-2-Pentanone	591-78-6	370	100
2-Hexanone	108-10-1	<100	100
Tetrachloroethene	127-18-4	< 50*	50
1,1,2,2-Tetrachloroethane	79-34-5	< 50	50
Toluene	108-88-3	320	50
Chlorobenzene	108-90-7	< 50	50
Ethylbenzene	100-41-4	< 50*	50
Styrene	100-42-5	< 50	50
Total Xylenes		54	50

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: J. Sima Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

Klick 5. Kline
Environmental/Analytical Testing Division

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: Sample Matrix:

Water

Date Sample Collected: October 12, 1988
Date Sample Received: October 14, 1988 October 25, 1988 Date Sample Analyzed:

VOLATILE COMPOUNDS ANALYTICAL RESULTS

SK-4

ATEC Lab No. 83277D

1 of 2

Analyte	CAS Number	oncentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	1,600	5
Acetone	67-64-1	15,000	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1 Dichloroethane	75-35-3	< 5°	5
Trans-1,2-Dichloroethene	156-60-5	< 5*	5
Chloroform	67-66-3	< 5*	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	1,400	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1.2-Dichloropropane	78-87-5	< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83277D

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	20	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591-78-6	1,800	10
2-Hexanone	108-10-1	18	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	770	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5*	5
Styrene	100-42-5	< 5	5
Total Xylenes		810	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: J. Sima Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

Environmental/Analytical Testing Division

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification:

Sample Matrix:

Water

Date Sample Collected: Date Sample Received: October 12, 1988 October 14, 1988

SK-5

Date Sample Analyzed:

October 26, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277E

1 of 2

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<5,000	5,000
Bromomethane	74-83-9	<5,000	5,000
Vinyl Chloride	75-01-4	<5,000	5,000
Chloroethane	75-00-3	<5,000	5,000
Methylene Chloride	75-09-2	<2,500	2,500
Acetone	67-64-1	130,000	5,000
Carbon Disulfide	75-15-0	<2,500	2,500
1,1-Dichloroethene	75-35-4	<2,500	2,500
1,1 Dichloroethane	75-35-3	<2,500	2,500
Trans-1,2-Dichloroethene	156-60-5	<2',500	2,500
Chloroform	67-66-3	<2,500*	2,500
1,2-Dichloroethane	107-06-2	<2,500	2,500
2-Butanone	78-93-3	11,000	5,000
1,1,1-Trichloroethane	71-55-6	<2,500	2,500
Carbon Tetrachloride	56-23-5	<2,500	2,500
Vinyl Acetate	108-05-4	<5,000	5,000
Bromodichloromethane	75-27-4	<2,500	2,500
1,2-Dichloropropane	78-87-5	<2,500	2,500

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83277E

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	<2,500	2,500
Trichloroethene	79-01-6	<2,500	2,500
Dibromochloromethane	124-48-1	<2,500	2,500
1,1,2-Trichloroethane	79-00-5	<2,500	2,500
Benzene	71-43-2	<2,500	2,500
cis-1,3-Dichloropropene	10061-01-5	<2,500	2,500
2-Chloroethylvinylether	110-75-8	<5,000	5,000
Bromoform	75-25-2	<2,500	2,500
4-Methyl-2-Pentanone	591-78-6	64,000	5,000
2-Hexanone	108-10-1	<5,000	5,000
Tetrachloroethene	127-18-4	<2,500	2,500
1,1,2,2-Tetrachloroethane	79-34-5	<2,500	2,500
Toluene	108-88-3	230,000	2,500
Chlorobenzene	108-90-7	<2,500	2,500
Ethylbenzene	100-41-4	<2,500*	2,500
Styrene	100-42-5	<2,500	2,500
Total Xylenes		7,300	2,500

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: SK-6

Sample Matrix:

Water

Date Sample Collected: Date Sample Received:

Date Sample Analyzed:

October 12, 1988

October 14, 1988 November 2, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277F

1 of 2

	c	Concentration	Quantitation
Analyte	CAS Number		Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5	5
Acetone	67-64-1	<10*	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1 Dichloroethane	75-35-3	< 5·	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5*	. 5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	. 10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83277F

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591-78-6	<10	10
2-Hexanone	108-10-1	<10	. 10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	<u>.</u> 5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 8, 1988

Respectfully submitted,

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: SK-6D

Sample Matrix:

Water

Date Sample Collected: October 12, 1988
Date Sample Received: October 14, 1988

Date Sample Analyzed:

October 26, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277G

1 of 2

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5	5
Acetone	67-64-1	<10*	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< .5	5
1,1 Dichloroethane	75-35-3	< 5∘	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5*	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	< 5	. 5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83277G

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6		5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591-78-6	<10	10
2-Hexanone	108-10-1	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5*	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification:

Sample Matrix: Water

Date Sample Collected: October 12, 1988
Date Sample Received: October 14, 1988
Date Sample Analyzed: October 26, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

SK-7D

ATEC Lab No. 83277H

1 of 2

		Concentration	
Analyte	CAS Number	(ug/L)	Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5	5
Acetone	67-64-1	<10*	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1 Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83277H

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591-78-6	<10	10
2-Hexanone	108-10-1	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5*	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 7, 1988

Respectfully submitted,

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: 8-D

Sample Matrix:

Water

Date Sample Collected: October 12, 1988
Date Sample Received: October 14, 1988
Date Sample Analyzed: October 27, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277I

1 of 2

		Concentration	Quantitation
Analyte	CAS Number	(ug/L)	Limit (ug/L)
Chloromethane	74-87-3	<50	50
Bromomethane	74-83-9	<50	50
Vinyl Chloride	75-01-4	<50	50
Chloroethane	75-00-3	<50	50
Methylene Chloride	75-09-2	<25	25
Acetone	67-64-1	<50*	50
Carbon Disulfide	75-15-0	<25	25
1,1-Dichloroethene	75-35-4	<25	25
1,1 Dichloroethane	75-35-3	<25	25
Trans-1,2-Dichloroethene	156-60-5	<25	25
Chloroform	67-66-3	<25	25
1,2-Dichloroethane	107-06-2	<25	25
2-Butanone	78-93-3	<50*	50
1,1,1-Trichloroethane	71-55-6	<25	25
Carbon Tetrachloride	56-23-5	<25	25
Vinyl Acetate	108-05-4	<50	50
Bromodichloromethane	75-27-4	<25	25
1,2-Dichloropropane	78-87-5	<25	25

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ATEC Lab No. 832771

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	<25	25
Trichloroethene	79-01-6	<25	25
Dibromochloromethane	124-48-1	<25	25
1,1,2-Trichloroethane	79-00-5	<25	25
Benzene	71-43-2	<25	25
cis-1,3-Dichloropropene	10061-01-5	<25	25
2-Chloroethylvinylether	110-75-8	<50	50
Bromoform	75-25-2	<25	25
4-Methyl-2-Pentanone	591-78-6	<50	50
2-Hexanone	108-10-1	<50	50
Tetrachloroethene	127-18-4	<25	25
1,1,2,2-Tetrachloroethane	79-34-5	<25	25
Toluene	108-88-3	<25	25
Chlorobenzene	108-90-7	<25	25
Ethylbenzene	100-41-4	<25	25
Styrene	100-42-5	<25	25
Total Xylenes		<25	25

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 8, 1988

Respectfully submitted,

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: SK-9

Sample Matrix:

Water

Date Sample Collected: October 12, 1988
Date Sample Received: October 14, 1988
Date Sample Analyzed: October 28, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277J

1 of 2

Analyte	CAS Number	oncentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5	5
Acetone	67-64-1	<10*	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1 Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5*	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87 - 5	< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83277J

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591-78-6	<10	10
2-Hexanone	108-10-1	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 8, 1988

Respectfully submitted,

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification: SK-10

Sample Matrix:

Water

Date Sample Collected: October 12, 1988
Date Sample Received: October 14, 1988
Date Sample Analyzed: October 28, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277K

1 of 2

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5	5
Acetone	67-64-1	<10	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1 Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5*	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10	10
1,1,1-Trichloroethane	71-55-6	< 5*	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83277K

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6		5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591-78-6	<10	10
2-Hexanoné	108-10-1	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 8, 1988

Respectfully submitted,

Client:

ATEC Environmental Services

Client Address:

1501 E. Main Street Griffith, IN 46319

Client Sample Identification:

Sample Blank

Sample Matrix:

Water

Date Sample Collected: Date Sample Received: Date Sample Analyzed:

October 12, 1988

October 14, 1988 November 2, 1988

VOLATILE COMPOUNDS ANALYTICAL RESULTS

ATEC Lab No. 83277L

1 of 2

Analyte	CAS Number	oncentration (ug/L)	Quantitation Limit (ug/L)
Chloromethane	74-87-3	<10	10
Bromomethane	74-83-9	<10	10
Vinyl Chloride	75-01-4	<10	10
Chloroethane	75-00-3	<10	10
Methylene Chloride	75-09-2	< 5*	5
Acetone	67-64-1	27	10
Carbon Disulfide	75-15-0	< 5	5
1,1-Dichloroethene	75-35-4	< 5	5
1,1 Dichloroethane	75-35-3	< 5	5
Trans-1,2-Dichloroethene	156-60-5	< 5	5
Chloroform	67-66-3	< 5*	5
1,2-Dichloroethane	107-06-2	< 5	5
2-Butanone	78-93-3	<10*	10
1,1,1-Trichloroethane	71-55-6	< 5	5
Carbon Tetrachloride	56-23-5	< 5	5
Vinyl Acetate	108-05-4	<10	10
Bromodichloromethane	75-27-4	< 5	5
1,2-Dichloropropane	78-87-5	< 5	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

ANALYTICAL RESULTS

ATEC Lab No. 83277L

Analyte	CAS Number	Concentration (ug/L)	Quantitation Limit (ug/L)
Trans-1, 3-Dichloropropene	10061-02-6	< 5	5
Trichloroethene	79-01-6	< 5	5
Dibromochloromethane	124-48-1	< 5	5
1,1,2-Trichloroethane	79-00-5	< 5	5
Benzene	71-43-2	< 5	5
cis-1,3-Dichloropropene	10061-01-5	< 5	5
2-Chloroethylvinylether	110-75-8	<10	10
Bromoform	75-25-2	< 5	5
4-Methyl-2-Pentanone	591-78-6	<10	10
2-Hexanone	108-10-1	<10	10
Tetrachloroethene	127-18-4	< 5	5
1,1,2,2-Tetrachloroethane	79-34-5	< 5	5
Toluene	108-88-3	< 5*	5
Chlorobenzene	108-90-7	< 5	5
Ethylbenzene	100-41-4	< 5*	5
Styrene	100-42-5	< 5	5
Total Xylenes		< 5*	5

^{*} Analyte detected but amount present is less than the Quantitation Limit.

Analytical Method: EPA Method 624

Analyst: M. McGill Verified: K. Kline

Date Reported: November 8, 1988

Respectfully submitted,

REPORT OF TEST RESULTS

ATEC Project Number 52-83217

DATE:

November 8, 1988

CLIENT:

ATEC Environmental Services

1501 E. Main Street Griffith, IN 46319

SAMPLE IDENTIFICATION:

Safety Kleen

Total Hydrocarbon Analysis SW 846 Method 8015 Revised

SAMPLE TAKEN BY:

ATEC (AR)

SAMPLE MATRIX:

Water

DATE SAMPLED:

October 12, 1988

DATE RECEIVED:

October 14, 1988

DATE ANALYZED:

October 26, 1988

ANALYST:

DAD

* Hydrocarbon detected below Quantitation Limit

Sample IdentificationTotal
HydrocarbonQuantitation
LimitSK-3<10 ppb*</td>10 ppb

Respectfully submitted, ATEC Associates, Inc.

REPORT OF TEST RESULTS

ATEC Project Number 52-83217

ATE:

November 8, 1988

CLIENT:

ATEC Environmental Services

1501 E. Main Street Griffith, IN 46319

SAMPLE IDENTIFICATION:

Safety Kleen

AMPLE MATRIX:

Water

AMPLE TAKEN BY:

ATEC (AR)

DATE SAMPLE TAKEN:

October 12, 1988 October 14, 1988

PATE RECEIVED:

occoper 14,

NALYST:

KEB, AJB

arameter	Sample	I.D. Number		SW 846
units in mg/l unless noted)	_SK-1	SK-2	MDL*	Analytical Method No.
Arsenic	< 0.05	< 0.05	0.05	7061
Barium	< 0.5	< 0.5	0.5	7080
Cadmium	< 0.01	0.01	0.01	7130
hromium:	< 0.05	< 0.05	0.05	7190
Lead	< 0.05	< 0.05	0.05	7420
lercury	<0.002	<0.002	0.002	7470
selenium	< 0.01	< 0.01	0.01	7741
Tilver	< 0.05	< 0.05	0.05	7760

* Method Detection Limit

Respectfully submitted, ATEC Associates, Inc.

Keir S. Kline

88327

CHAIN OF CUSTODY RECORD

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Purge Date:	0/12/88		Casi	ng Vol. (gals.)	1.50	<u>~</u>
Purge Time	2:00 PM	 .		Purged (gals.)		1
Sample Date:	0/12/88		Sa	imple Method	tetlor	_bai
Sample Time:	2:15 pm			_		
Elevation			To	al Well Depth	12.1	5
Water Level	2.8'		, 00			
GW Elevation:			Samo	e Temp. (°C)		
OW Elevanon						
	<					
Veather Conditions:	Ch.	Windy	<u> </u>		11	
ample Appearance: amplér Comments:	(100 dy)	-black,	Steers 1	rydenca z	Ber este	<u>,</u>
[ampier Comments]	<u>uell</u>	recharge	13 5/cm	ly) 	eccioca.	
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nple Composited (X):	Procedu	:	· · ·			
pH Sp. Cond (umhos)	Procedu	ure/Proportions:				······································
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pH Sp. Cond (umhos)	Procedu	ure/Proportions:	= (12.)	15 - 2.8) < 0.7	
pH Sp. Cond (umhos)	Procedu	ure/Proportions:	= (12.)	15 - 2.8) < 0.7	
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pH Sp. Cond (umhos)	Procedu	ure/Proportions:	= (12.)	15 - 2.8) < 0.7	
pH	Procedu	ure/Proportions:	= (12./ - /. 5	5-2.8) < 0. (
pH Sp. Cond (umhos)	Procedu	ure/Proportions:	= (/2./ - /. 5	/ 5 - 2. 8 -5 - /s) <u> </u>	

TABLE 5

Facility Name Salety - Hen , Do	LEGA, IL Sample Point De SK-2
Purge Date: 10/17/88	Casing Vol. (gals.): /1.3 D
Purge Time: 341	Vol. Purged (gals.) 20
Sample Date: 10/12/88	Sample Method tefton bailer
Sample Time 350	
Elevation:	Total Well Depth: 12.2
Water Level 4.3	Stick-Up:
GW Elevation	Sample Temp. (° C)
GW Elevation	
	500F, windy
Weather Conditions: Sandy 1	don't be store solvers odon
Sample Appearance: (16474)	clark br., stream solvent ador
	uols removed
	1015. removed
	<u></u>
Unable To Obtain Sample (X):Reason:	
Sample Composited (X): Procedure/Procedu	oportions:
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рН	
,	
Sp. Cond	
(003)	
Lab Comments: 4. 0.163	= CAS VO/.
	- /.30
	** :
	and the state of t
I certify that sampling procedures were in accord	lance with EPA and corporate protocols.
Sampler Name (print) _ ANGRES 12014	R Signature Chicken Reluc
	· · ·

Purge Date: 10/12/88 Purge Time: 3:50 Sample Date: 10/12/88 Sample Time: 4:00	Casing Vol. (gals.): 1.18 Vol. Purged (gals.): 3.54 Sample Method: Lefton bails
Elevation Water Level: 2-2 GW Elevation:	Stick-Up
<u> </u>	eny I wordy, 50°/- ely, moderate solvent odar
	re/Proportions:
Sp. Cond (umhos)	
Lab Comments: Coscoy	1001= (945-22) x 0.163 = 1.18 50/2
certify that sampling procedures were in a sampler Name: (print) Andrews Le	scordance with EPA and corporate protocols. Signature Chefren Rolve

TABLE 5

Facility Name Safety - Hern, A	Oalen, The Sample Point I.D. K.4
Purge Date 10/12/88	Casing Vol. (gals.): 1.5 gal
Purge Time 2:50	Vol. Purged (gals.): 45 gal
Sample Date: 10/12/88	
Sample Time: 3:00	
Elevation:	Total Well Depth: 12 1
Water Level 2.9	Stick-Up
GW Elevation	Sample Temp. (° C)
	
Weather Conditions Sana	y, wordy, SOOF
Sample Appearance Cloudy	dant brown to ced, strong
Sampler Comments: 50/4	ent odor
·	
·	
Unable To Obtain Sample (X):Reason:	
Sample Composited (X): Procedure/f	Proportions:
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Sp. Cond	
(umhos)	
Lab Comments Casing	Vol = (12.1-2.9) × 0.163
·	= 1.5 5als
	
	
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I certify that sampling procedures were in acco	ordance with EPA and corporate protocols
	Signature Chelien Lewe
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acinty Maine	tety-there,	
Purge Date		Casing Vol. (gals.): Lo ger
Purge Time:		Vol. Purged (gals.): 4.7 gul
Sample Date	10/2/88	Sample Method: Ection bai
Sample Time:	3:15	
		
Elevation:		Total Well Depth: 12,15
Water Level	2.47'	Stick-Up:
		Sample Temp. (° C):
·		
Weather Conditions	Sanny	windy, 450 F
Sample Appearance:	Cloudy	black-brown, very strong
Sampler Comments	che	mud odec
		·
 háble To Obtain Sample	(X):Reason: _	
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· · · · · · · · · · · · · · · · · · ·		
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mple Composited (X): _	Procedur	e/Proportions:
mple Composited (X): _	Procedur	e/Proportions:
mple Composited (X): _ pH _ Sp. Cond	Procedur	e/Proportions:
pH _ Sp. Cond (umhos)	Procedur	e/Proportions:
mple Composited (X): _ pH _ Sp. Cond	Procedur	e/Proportions: 6.3 = Cas vol.
pH _ Sp. Cond (umhos)	Procedur	e/Proportions:
pH _ Sp. Cond (umhos)	Procedur	e/Proportions: 6.3 = Cas vol.
pH _ Sp. Cond (umhos)	Procedur	e/Proportions: 6.3 = Cas vol.
pH _ Sp. Cond (umhos)	Procedur	e/Proportions: 6.3 = Cas vol.
pH _ Sp. Cond (umhos) Lab Comments:	h. 0.1	e/Proportions: $6.3 = Cas vol.$ $= (12.15 - 2.42) \times 0.163$ $= 1.58$
pHSp. Cond(umhos) Leb Comments:	Procedur	e/Proportions: 6.3 = Cas vol.

TABLE 5

Facility Name Safety - Heen , De	Sample Point I.D. SK-6
Purge Date: 10/12/88	Casing Vol. (gals.): 1.32 gal
Purge Time: 3 30 PM	Vol. Purged (gals.): 2.0 gal
Sample Date: 10/12/88	Sample Method Lefton bailer
Sample Time: 3 '40	
Elevation:	Total Well Depth: 12-12
Water Level 4.0	Stick-Up
GW Elevation:	
	wordy, 500F
	slightly furchied
Sampler Comments: poor ce	charge in well
Unable To Obtain Sample (X):Reason:	
Sample Composited (X): Procedure/Pr	oportions:
рН	
So Cood	
Sp. Cond (umhos)	
Lab Comments: 4 . 0.163 =	Cis volume
	(12.12 - 4.01) x 0.163
=	1.32 50/5
	
<u> </u>	
Leggit	
Sampler Name of the Control of the C	lance with EPA and corporate protocols.
Sampler Name (print) ANCINES (Seeve	Signature Conclew Relive
<u> </u>	

TABLE 5

Purge Date: 10 Purge Time: Sample Date: 10 Sample Time:	12/88	Casing Vol. (gals.): Vol. Purged (gals.): Sample Method:	. 4
Elevation: Water Level: GW Elevation:		Total Well Depth: 42 Stick-Up: Sample Temp. (°C):	
Weather Conditions Sample Appearance Sampler Comments		ndy , 500F	· · · · · · · · · · · · · · · · · · ·
		<u>.</u>	
		ons:	· · · · · · · · · · · · · · · · · · ·
mple Composited (X):	Procedure/Proportio	ons:	
pH	Procedure/Proportio	ons:	

•		
Purge Date:	0/12/88	Casing Vol. (gals.): 2,9
Purge Time:		Vol. Purged (gals.):
Sample Date:	0/12/88	Sample Method: Lefton baile
Sample Time:	3:30	
Elevation:		Total Well Depth: 45.3
Water Level	27.R	Stick-Up
		
Weather Conditions:		ny undy 500F
Sample Appearance:		low tubidity
Sampler Comments	oil spilled	
·	MACAIT	to be in well
	7.7	
nable To Obtain Sample	(X):Reason: _	<u> </u>
		/Proportions:
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_ Hq	· · · · · · · · · · · · · · · · · · ·	
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Sp. Cond (umhos)		
Sp. Cond		1103 = 003 UM
Sp. Cond (umhos)		1103 = 063 UM = (45.3-278) × 0.163
Sp. Cond (umhos)		1103 = 003 UM
Sp. Cond (umhos)		1103 = 063 UM = (45.3-278) × 0.163
Sp. Cond. <u> </u>		1103 = 063 UM = (45.3-278) × 0.163
Sp. Cond. <u> </u>		1103 = 063 UM = (45.3-278) × 0.163
Sp. Cond(umhos) Lab Comments	h	1103 = 103 inf = (453-278) × 0.163 = 2.9 5 als
Sp. Cond (umhos) Lab Comments: certify that sampling pro-	cedures were in acc	1103 = 063 UM = (45.3-278) × 0.163

TABLE 5

	Casing Vol. (gals.): 3-06 gal
Purge Date 1:00 PM	Vol. Purged (gals.): 10-0 gal
Sample Date: 10/12/88	Sample Method: Lefton ba.
Sample Time: 1:30 PM	
- Campie 1 mie	
Elevation:	Total Well Depth: 43.3
Water Level 24.5	Stick-Up:
GW Elevation:	
Weather Conditions: Sanz	y unidy 500F
Sample Appearance: C/ea	in low tarbiel by
Sampler Comments:	
-	
nable To Obtain Sample (X):Reason: _	
·	e/Proportions:
ample Composited (X): Procedure	
ample Composited (X): Procedure	e/Proportions:
ample Composited (X): Procedure	e/Proportions:
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pHSp. Cond	e/Proportions:
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pHSp. Cond(umhos)	e/Proportions:
pHSp. Cond(umhos)	e/Proportions:
pHSp. Cond(umhos)	e/Proportions:
pHSp. Cond(umhos)	e/Proportions:
pHSp. Cond(umhos)	e/Proportions:
pHSp. Cond(umhos)	e/Proportions:
pHSp. Cond(umhos)	e/Proportions:
pH Sp. Cond (umhos) Lab Comments:	= $H_{s,C}$ $V_{c}/(s_{c}/s) = 3.06$ gal
pH	e/Proportions:

Facility Name Safet Purge Date: 10 Purge Time: 4:1 Sample Date: 4: Sample Time: 4:	0	Casing Vol. Pe	ole Point I.D.; g Vol. (gals.); urged (gals.); nple Method;	1.2	bailer
Elevation: Water Level: GW Elevation:			Stick-Up:	11.6	··· ····· ·····
Weather Conditions Sample Appearance Sampler Comments		•	oof ende b	arbid. Kg	
Unable To Obtain Sample (X):_ Sample Composited (X):					· · · · · · · · · · · · · · · · · · ·
pH Sp. Cend (umhos)					
Lab Comments	Casing Vo	1 = 0.163 = 1.2 g		- 4.1)	
I certify that sampling procedu Sampler Name: (print)A_C	res were in accordance	e with EPA and corp	orate protoc Ancheu	ois. J. Rewe	

TABLE 5

	1. (10.100	\	0	l (aala):	1 1 1	
Purge Date:_	10/12/88			l. (gals.):		
Purge Time:_			Vol. Purge	d (gals.)	3.3	
Sample Date:	10/12/88	,	Sample	Method:	etion.	bai
Sample Time:	4:05 PM	\				·
				· <u>·</u>		
Elevation:			Total We	ell Depth:	9.8	
Water Level	2,8			Stick-Up:		
GW Elevation:				np. (° C):		
GW Elevation_			Sample 10.			 'ê
Veather Conditions:_	Sano	y winde	500/			
ample Appearance_	C/e	ar I made	exte face	bid ty		-
Sampler Comments_	•				•	-
_	·			<u> </u>		-
– able To Obtain Samp	le (X):Reaso	n:				-
						-
mple Composited (X)						- - -
mple Composited (X)	: Proced	dure/Proportions:				-
mple Composited (X) pH Sp. Cond.	: Proced	dure/Proportions:				-
pH Sp. Cond. (umhos)	: Proced	dure/Proportions:	0.163 x			-
pH Sp. Cond. (umhos)	: Proced	dure/Proportions:	0.163 x			
pH Sp. Cond. (umhos)	: Proced	dure/Proportions:	0.163 x			
pH Sp. Cond. (umhos)	: Proced	dure/Proportions:	0.163 x			
pH Sp. Cond. (umhos) Lab Comments:	Proced	dure/Proportions:	C./63 x	(98-	2.8)	
pH Sp. Cond. (umhos)	rocedures were in	dure/Proportions:	C. / E 3 x / / 5 e / s EPA and corpora	(9 E -	2.8)	-

TABLE 5

•	ty- Hen Dollen		
Purge Date:/O_	1 188	Casing Vol. (gals.)	······································
Purge Time:		Vol. Purged (gals.)	
Sample Date: 10	/ /88	Sample Method <u>Le Floa</u>	bailer
Sample Time:			
Flevation		Total Well Depth: 7.6	
*		Stick-Up:	•
GW Elevation:	,	Sample Temp. (° C):	
OW Elevation			
Weather Conditions:			
Sample Appearance		- · · · · · · · · · · · · · · · · · · ·	_
Sampler Comments:	<u>-::::::::::::::::::::::::::::::::::::</u>		
<u> </u>			
<u> </u>			·
Jnable To Obtain Sample (X):	Reason:		-
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Sp. Cond.		<u></u>	
(umhos)			
·			:
Lab Comments:			
· ·			<u>.</u>
			
	 		
	 	 	
certify that sampling proceds	ures were in accordance	with EPA and corporate protocols.	
Sampler Name (print) Aug	24.095 Garl	Signature aucher Clerk	. ,

APPENDIX V-A

SAFETY-KLEEN CORP. HEALTH, SAFETY, AND ENVIRONMENTAL POLICY

VISITORS TO SAFETY-KLEEN'S DOLTON RECYCLE CENTER

The following precautions are necessary for the protection of our employees and visitors. We ask that you please read them carefully.

- Smoking is not permitted within the facility.
- 2. A hard hat and safety glasses must be worn in the plant at all times.
- 3. Visitors must not tour the plant unescorted. We ask that all visitors be accompanied by an employee of the plant or another authorized Safety-Kleen person.
- 4. In the event of an emergency, please go directly to the Administrative Office. Following a personnel head count, all visitors will be escorted out of the facility.

THANKS FOR YOUR COOPERATION



633 East 138th Street Dolton, Illinois 60419 (708) 849-4850



Health, Safety and Environmental Policy

Safety-Kleen is Safety First

It is the policy of Safety-Kleen Corp. that in the operation of its business the Company and all of its employees shall endeavor to minimize risk of harm to human health and the environment. Each employee shall place the highest importance and priority on the protection of health and safety, and preservation of the environment.

To implement this policy:

- 1. The Company's business operations shall be conducted in full compliance with all federal, state and local laws and regulations.
- 2. The Company shall develop guidances for the implementation of laws and regulations, and may adopt additional standards where laws and regulations may not be adequately protective. The Company's business operations shall be conducted in compliance with all such guidances and standards.
- 3. The Company shall establish and maintain training and compliance programs to assure that all laws and regulations, and all Company guidances and standards are known, understood and obeyed by all employees.
- 4. The Company shall establish and maintain accident prevention, product safety and integrity, occupational health, and pollution control programs to safeguard employees, customers and the public from injuries or health hazards, to protect the environment and to protect the corporation's assets and continuity of operations.
- 5. The Company shall cease any operations that cannot be conducted in a manner consistent with this policy.

It is the responsibility of each and every employee, at all levels, to adhere to the spirit as well as the letter of this policy. All employees shall have a responsibility to keep informed about health, safety and environmental matters, and to promptly advise their immediate superior of any adverse situation that comes to their attention.

Consid W. Brenche

APPENDIX V-B

MATERIAL SAFETY DATA SHEETS SAFETY-KLEEN CORP.

SAFETY-KLEEN 105 PARTS WASHING SOLVENT MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123 For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE

MEDICAL:

TRANSPORTATION:

These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.

800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS)

800/424-9300

CHEMTREC

IDENTITY (TRADE NAME):

SAFETY-KLEEN 105 PARTS WASHING SOLVENT

SYNONYMS:

PETROLEUM DISTILLATES, PETROLEUM NAPHTHA.

MINERAL SPIRITS, STODDARD SOLVENT

SK PART NUMBER:

6617

FAMILYICHEMICAL NAME:

HYDROCARBON SOLVENT

PRODUCT USAGE:

SOLVENT FOR CLEANING AND DEGREASING PARTS

SECTION II - HAZARDOUS COMPONENTS

NAME	SYNONYM	%	CAS NO.	OSHA PEL (ppm)	ACGIH TLV (ppm)
rts Washer Solvent (consists predominantly of C9-C13 hydrocarbon)	Mineral Spirits	(Typical % by Wt.)			
C9-C13 Semrated Hydrocarbon		85	64741-41-9	100 (Stoddard Solvent)	100 (Stoddard Solvent)
*Toluene		0.5	106-88-3	100 150 STEL	100 150 STEL
*Xylene		1.0	1330-20-7	100 150 STEL	100 150 STEL
°Ethyl Benzene		0.5	100-41-4	100 Skin 125 STEL	100 125 STEL
CS+ Aromatics		12.0	Mixture	N/E	NE
Chlorinated Solvents		(Max 1% by Wt.)			
*1,1,1 Trichloroethene		<0.5	71-55-6	350 450 STEL	350 450 STEL
*Tetrachloroethylene		<0.5	127-18-4	25	50 200 STEL

N/E = Not Established

SECTION III - PHYSICAL DATA

HYSICAL STATE, PPEARANCE AND ODOR:

Combustible liquid - clear, green, with characteristic hydrocarbon odor.

BOILING POINT:

300° - 429° F

See Section X - Other Regulatory Information

EVAPORATION RATE:

(Butyl Acctate = 1) 0.1

PERCENT VOLATILE:

99.9%

VAPOR DENSITY:

4.9 (Air = 1)

VAPOR PRESSURE:

2 mm of Hg at 68° F

SOLUBILITY IN WATER:

Negligible

pH:

Not Applicable

SPECIFIC GRAVITY:

0.77 to 0.80

795 g/L

MOLECULAR WEIGHT:

Approximately 142

VOLATILE ORGANIC COMPOUNDS:

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT:

105° F (SETA)

AUTOIGNITION TEMPERATURE:

473° F

CONDITIONS OF FLAMMABILITY:

Materials must be moderately heated before ignition can occur.

FLAMMABLE LIMITS IN AIR - LOWER:

0.7%

UPPER: 6.0%

EXTINGUISHING MEDIA:

Carbon dioxide, foam, dry chemical, water (mist only).

FIRE FIGHTING PROCEDURES - SPECIAL:

NFPA 704 Rating 2-2-0

Keep storage tanks cool with water spray. Use self-contained breathing apparatus (SCBA).

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Decomposition and combustion products may be toxic. Heated tanks may rupture, explode or be thrown into the air. Vapors are heavier than air and may travel great distances to ignition source and flashback.

HAZARDOUS COMBUSTION PRODUCTS:

Thermal decomposition and burning may produce carbon monoxide.

SECTION V -- REACTIVITY DATA

STABILITY:

Normally stable even under fire exposure conditions and is not reactive with

water. Normal firefighting procedures may be used.

INCOMPATIBILITY

(CONDITIONS TO AVOID):

Strong oxidizing agents (e.g. chlorine, peroxides, strong acids).

HAZARDOUS

POLYMERIZATION:

Not known to occur under normal conditions.

HAZARDOUS DECOMPOSITION

PRODUCTS:

Normally none; however, incomplete burning may yield carbon monoxide.

SECTION VI - HEALTH HAZARD DATA

PRIMARY ROUTES OF EXPOSURE:

Skin and eye contact; inhalation.

IEALTH HAZARD DATAISIGNS AND SYMPTOMS OF EXPOSURE:

ACUTE:

Skin: Prolonged or repeated contact tends to remove skin oils, possibly leading to irritation and dermatitis. No significant skin absorption hazard.

Eyes: Contact may cause slight to moderate irritation. High vapor concentrations (> 500 ppm) are irritating to the eyes.

Inhalation: High concentrations of vapor or mist may be irritating to the respiratory tract, cause headaches, dizziness, nausea, impaired coordination, anesthesia and may have other central nervous system effects

Ingestion: Low order of acute oral toxicity. May cause irritation of the throat, nausea, vomiting and symptoms of central nervous system depression. Aspiration into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.

CHRONIC:

Prolonged and/or repeated contact may cause drying and cracking of the skin or dermatitis.

OTHER POTENTIAL HEALTH HAZARDS:

The impurities that may be present are not expected to add significantly to the effects of exposure.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Individuals with pre-existing central nervous system dysfunction may have increased susceptibility to the effects of exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY:

Tetrachloroethylene is listed by IARC and NTP as a suspected carcinogen. Studies indicate that Ethyl Benzene and 1,1,1 Trichloroethane are experimental teratogens.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES:

For direct contact, flush eyes with water for 15 minutes lifting upper and lower lids occasionally. Consult physician if irritation or pain persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure into fresh air.

SKIN:

Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and persists, consult a physician.

INGESTION:

If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION:

Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL

PROCEDURES:

Remove all ignition sources. Ventilate area and avoid breathing vapors. For large spills, isolate area and deny entry. If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL

METHODS:

Dispose in accordance with Federal, State, and local regulations. Contact Safety-Kleen regarding recycling.

HANDLING

PRECAUTIONS:

Avoid contact with eyes, skin or clothing. Use in well ventilated area and avoid breathing vapors or mists. Keep away from heat, sparks and open flames.

HIPPING AND STORING

PRECAUTIONS:

Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

PERSONAL. HYGIENE:

Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco products. Launder contaminated clothing and clean protective equipment before reuse.

SECTION IX -- CONTROL MEASURES

VENTILATION:

Provide local exhaust or general dilution ventilation as determined necessary to maintain concentrations of vapors or mists below applicable exposure limits. Where explosive mixtures may be present, systems safe for such locations should be used.

PROTECTIVE

GLOVES:

Use nitrile or neoprene gloves to prevent contact with skin.

EYE

PROTECTION:

Where there is likelihood of spill or splash, wear chemical goggles or faceshield. Contact lenses

should not be worn.

RESPIRATORY

PROTECTION:

Use NIOSH-approved respiratory protective equipment when concentration of vapors or mists exceeds applicable exposure limit. Depending on the airborne concentration, use a respirator or gas mask with appropriate carridges and canisters (for organic vapor with mist prefilter). A selfcontained breathing apparatus (SCBA) is required for large spills and emergencies. Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry Standard 29 CFR 1910.134 - Respiratory Protection.

OTHER PROTECTIVE

EQUIPMENT:

Wear solvent-resistant boots, appron or other protective clothing where spills and splashes are possible. A source of clean water should be available in work areas for flushing the eyes and skin.

SECTION X -- OTHER REGULATORY INFORMATION

JOT PROPER SHIPPING NAME:

Petroleum Naphtha

DOT CLASS:

Combustible Liquid

DOT NUMBER:

UN 1255

SARA TITLE III:

Product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Toxic constituents are listed with an asterisk in Section II of this Material Safety Data Sheet.

Product poses the following physical and/or health hazard(s) as defined in

40 CFR 370.3 (Sections 311, 312 of SARA Title III):

Immediate (Acute) Health Hazard Delayed (Chronic) Health Hazard

Fire Hazard

SECTION XI - PREPARATION INFORMATION

PREPARED BY:

SK Product Review Committee

FORM NO. 900-14-001

ORIGINAL ISSUE DATE: July 20, 1989

REVISED: March 12, 1990 SUPERSEDES: July 20, 1989

User assumes all risks incident to the use of this product. To the best of our knowledge, the information contained herein is accurate. However, Safety-Kleen assumes no liability whatsoever for the accuracy or completeness of the information contained herein. No representations or warranties, either express a implied, or merchantability, fitness for a particular purpose or of any other nature are made hereunder with respect to information or the product to which domation refers. The data contained on this sheet applies to the material as supplied to the user.

IMMERSION CLEANER/CARBURETOR AND COLD PARTS CLEANER 609 MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123 For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE

MEDICAL:

TRANSPORTATION:

These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.

800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS) 800/424-9300 CHEMTREC

IDENTITY (TRADE NAME):

IMMERSION CLEANER/CARBURETOR AND COLD

PARTS CLEANER 609

SK PART NUMBER:

609, 6631, 50

FAMILYICHEMICAL NAME:

NA

PRODUCT USAGE:

REMOVING CARBON RESIDUE FROM PARTS

SECTION II - HAZARDOUS COMPONENTS

NAME	SYNONYM	<u>%</u>	CAS NO.	OSHA PEL (ppm)	ACGIH TLV (ppm)
ylic Acid	Mixed Cresols	11.9	1319-77-3	5 (Skin)	5 (Skin)
Petroleum Sulfonate Contains: Hexylene Glycol	Surfactant Blend	7.4	107-41-5	25(C)	25(C)
Diethylene Glycol			111-46-6	N/E	N/E
*Methylene Chloride	Dichloromethane	31.7	75-09 . 2	500 1000(C)	50 .
Di-chlorobenzenes: *(o-dichlorobenzene) *(p-dichlorobenzene)	ODCB	10.5 10.5	95-50-1 106-46-7	50(C) 75 110 STRL	50(C) 75 110 STEL
(m-dichlorobenzene)		10.5	541-73-1	N/E	N/B
Complex Amines Contains:	Rust Inhibitor	0.4			
Propargyi Alcohol *Isopropyi Alcohol			107-19-7 67-63-0	1 (Skin) 400 500 STEL	1 (Skin) 400 500 STEL
Triethanolemine	TEA	0.4	102-71-6	N/E	N/E
Water		16.8	7732-18-5	N/E	N/E

^{*} See Section X - Other Regulatory Information

N/E = Not Established

(C) = Ceiling Concentration

SECTION III - PHYSICAL DATA

PHYSICAL STATE, EARANCE AND ODOR: Liquid - clear, dark amber, with aromatic odor. Two distinct layers comprise the product; top layer water, lower layer solvent.

BOILING POINT:

102° - 395° F

MELTING POINT:

ot known

EVAPORATION RATE:

1.0 (Water = 1)

PERCENT VOLATILE:

Majority

VAPOR DENSITY:

Same as Water

VAPOR PRESSURE:

Same as Water

SOLUBILITY IN WATER:

Completely miscible in all proportions.

pH:

9-10 in water phase

SPECIFIC GRAVITY:

1.19 (Water = 1.0)

MOLECULAR WEIGHT:

Use molecular weights of individual components.

VOLATILE ORGANIC COMPOUNDS:

750 g/L

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT:

Non-Flammable

AUTOIGNITION TEMPERATURE:

Not Known

CONDITIONS OF FLAMMABILITY:

Non-Flammable

FLAMMABLE LIMITS IN AIR - LOWER:

Non-Flammable

UPPER: Non-Flammable

EXTINGUISHING MEDIA:

None Special

FIRE FIGHTING PROCEDURES - SPECIAL:

None; product is non-flammable. NFPA 704 Rating 3-2-0

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Although product is non-flammable, flames, welding arcs or other high temperature sources can cause decomposition. This decomposition can yield corrosive and toxic gases, vapors mists or fumes. Use a self-contained breathing apparatus (SCBA).

HAZARDOUS COMBUSTION

PRODUCTS:

Although product is non-flammable, flames, welding arcs or other high temperature sources can cause decomposition. This decomposition can yield corrosive and toxic gases, vapors, mists or fumes (e.g. hydrogen chloride, phosgene, carbon monoxide, etc.)

SECTION V -- REACTIVITY DATA

STABILITY:

Normally stable.

INCOMPATIBILITY:

Strong oxidizing agents

(CONDITIONS TO AVOID)

(e.g. chlorine, peroxides, strong acids)

HAZARDOUS

POLYMERIZATION:

Not known to occur under normal conditions.

HAZARDOUS DECOMPOSITION

PRODUCTS:

Normally none; however, flames and welding arcs can produce corrosive and toxic gases, vapors and fumes (e.g. hydrogen chloride, phosgene, carbon monoxide).

SECTION VI -- HEALTH HAZARD DATA

PRIMARY ROUTES OF EXPOSURE:

Inhalation, skin and eye contact, skin absorption.

HEALTH HAZARD DATA/SIGNS AND SYMPTOMS OF EXPOSURE:

ACUTE:

Skin: Corrosive to living tissue and is rapidly absorbed through the skin causing systemic poisoning. Contact with unprotected skin can cause discoloration, irritation, blistering and slow healing chemical burns. Partial anesthetic properties may mask affects.

Eyes: Contact with liquid may cause severe chemical burns and produce permanent damage.

Inhalation: May result in severe respiratory irritation; gastrointestinal distress (nausea, vomiting), central nervous system depression (headache, drowsiness, dizziness, confusion) and tingling or numbness of the extremities. Severe exposures may lead to respiratory failure, coma and death.

Ingestion: May produce burning pain in the mouth and stomach, severe abdominal pain with nausea, vomiting, slow respiration and irregular pulse, and dark blue skin discoloration. Symptoms similar to those for inhalation also may occur.

CHRONIC:

Exposure to high concentrations may lead to damage to the liver, kidneys and lungs. Contact with skin may cause dermatitis, gastrointestinal disorders and produce symptoms similar to those for inhalation.

OTHER POTENTIAL HEALTH HAZARDS:

Metabolism of methylene chloride may elevate carboxyhemoglobin levels.

MEDICAL CONDITIONS

AGGRAVATED BY

EXPOSURE:

Individuals with pre-existing liver, kidney, lung or cardiovascular dysfunction may have increased susceptibility to the effects of exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY:

Methylene chloride is listed by NTP and IARC as a suspected carcinogen. P-dichlorobenzene is listed

by IARC as a suspected carcinogen.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

ES:

For direct contact, flush eyes with clean water for 15 minutes lifting upper and lower lids occasionally. Consult physician if irritation persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure and into fresh air.

SKIN:

Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and persists, consult a physician.

INGESTION:

Aspiration hazard. If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION:

Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL

PROCEDURES:

Ventilate area and avoid breathing vapors. Absorb spill with oil absorbent or soda ash. Catch and collect for recovery as soon as possible. Shovel into closable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS:

Dispose in accordance with Federal, State and local regulations. Contact Safety-Kleen regarding recycling.

HANDLING PRECAUTIONS:

Keep away from heat, sparks and open flames. Use adequate ventilation. Avoid contact with skin, eyes and clothing. Avoid breathing vapors.

SHIPPING AND STORING

PRECAUTIONS:

Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use

and during transport.

PERSONAL. HYGIENE:

Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating. drinking or using tobacco products.

SECTION IX - CONTROL MEASURES

VENTILATION:

Provide local exhaust or general dilution ventilation, as determined necessary, to maintain

concentrations of vapors below applicable exposure limits.

PROTECTIVE GLOVES:

Wear Viton gloves to prevent skin contact.

EYE PROTECTION:

Where there is a likelihood of contact with the face and/or eyes, wear a faceshield and

chemical goggles. Contact lenses should not be worn.

RESPIRATORY PROTECTION:

Use NIOSH-approved respiratory protective equipment when concentration of vapors exceeds applicable exposure limit. Depending on the airborne concentration, use a respirator or gas mask with appropriate cartridges or canisters (for organic vapors). A self-contained breathing apparatus (SCBA) is required for large spills and emergencies. Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry

Standard 29 CFR 1910.134 - Respiratory Protection.

OTHER PROTECTIVE **EQUIPMENT:**

A source of clean water should be available in the work area for flushing eyes and skin. Wear solvent-resistant boots, apron or other protective clothing where spills or splashes are possible.

SECTION X -- OTHER REGULATORY INFORMATION

DOT PROPER

SHIPPING NAME:

Compound, Cleaning Liquid

DOT CLASS:

Corrosive Liquid

DOT ID NUMBER:

NA1760

SARA TITLE III:

Product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Toxic constituents are listed with an asterisk in Section II of this Material Safety Data Sheet.

Product poses the following physical and/or health hazard(s) as defined in

40 CFR 370.3 (Sections 311, 312 of SARA Title III):

Immediate (Acute) Health Hazard Delayed (Chronic) Health Hazard

SECTION XI -- PREPARATION INFORMATION

PREPARED BY:

SK Product Review Committee

FORM NO. 900-14-002

ORIGINAL ISSUE DATE: July 20, 1989 REVISED: December 1, 1989

SUPERSEDES: July 20, 1989

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SAFETY-KLEEN IMMERSION CLEANER AND COLD PARTS CLEANER 699 MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123 For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE

MEDICAL:

TRANSPORTATION:

These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.

800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS)

800/424-9300 CHEMTREC

IDENTITY (TRADE NAME):

SAFETY-KLEEN IMMERSION CLEANER AND COLD

PARTS CLEANER 699

SK PART NUMBER:

6861, 699

FAMILY/CHEMICAL NAME:

NA

PRODUCT USAGE:

REMOVING CARBON RESIDUE FROM PARTS

SECTION II - HAZARDOUS COMPONENTS

NAME	SYNONYM	TYPICAL %BYWT.	CAS NO.	OSHA PEL (pom)	ACGIH TLV (ppm)	
omatic 150	Heavy Aromatic Naphtha		64742- 9 4-5	100 (Exxon)	100 (Exxon)	
*(May contain up to 5% N	aphthalene)		91-20-3	10 15 STEL	10 15 STEL	
N-Methyl-2-Pyrrolidone	NMP		872-50-4	100 (BASF)	100 (BASF)	
Dipropylene Glycol Methyl Ether	Dipropylene Glycol Monomethyl Ether		34590-94-8	100 150 STEL	100 150 STEL	
Monoethanolamine	Ethanolamine		141-43-5	3 6 STEL	3 6 STEL	
Olaic Acid	Red Oil		112-80-1	N/E	N/E	
Water			7732-18-5	-	•••	
**(Total chlorinated solver	atel	02 (Mez)				

**(Total chlorinated solvents)

0.2 (Max)

N/E = Not Established

SECTION III -- PHYSICAL DATA

PHYSICAL STATE. APPEARANCE AND ODOR: Clear, reddish brown liquid with hydrocarbon odor.

BOILING RANGE:

210° - 439° F

IELTING POINT:

<10°F

EVAPORATION RATE:

1.0 (Water = 1)

^{*} See Section X - Other Regulatory Information **No individual chlorinated solvent > 0.1%

PERCENT VOLATILE:

92 WL %

N/E

VAPOR DENSITY:

2.6 (Air = 1.0)

VAPOR PRESSURE:

10.9 mm Hg at 25° C

SOLUBILITY IN WATER:

Completely miscible in all proportions.

pH:

10.8, 50/50 (Water/Solvent)

SPECIFIC GRAVITY:

0.95 (Water = 1.0)

MOLECULAR WEIGHT:

127. Average molecular weight of components.

VOLATILE ORGANIC COMPOUNDS:

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT:

SETA, 142° F (Min.)

AUTOIGNITION TEMPERATURE:

Not Known

CONDITIONS OF FLAMMABILITY:

Ignitable, if material is heated above its flash point.

FLAMMABLE LIMITS IN AIR - LOWER:

0.8

UPPER: 7.0

EXTINGUISHING MEDIA:

None Special

FIRE FIGHTING PROCEDURES - SPECIAL:

NFPA 704 Rating 2-2-1

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Decomposition and combustion products may be toxic. Heated tanks may rupture, explode or be thrown into the air. Vapors are heavier than air and may travel great distances to ignition

source and flashback.

HAZARDOUS COMBUSTION PRODUCTS:

Thermal decomposition and burning may produce carbon monoxide, oxides of nitrogen and acrid smoke.

SECTION V -- REACTIVITY DATA

STABILITY:

Normally stable.

INCOMPATIBILITY:

Strong oxidizing agents

(CONDITIONS TO AVOID)

(e.g. chlorine, peroxides, strong acids)

HAZARDOUS

POLYMERIZATION:

Not known to occur under normal conditions, oxides of nitrogen and acrid smoke.

Glycol ethers have been shown to form explosive peroxides.

HAZARDOUS DECOMPOSITION

PRODUCTS:

Normally none; however, incomplete burning may yield carbon monoxide.

SECTION VI -- HEALTH HAZARD DATA

PRIMARY ROUTES

OF EXPOSURE:

Inhalation, skin and eye contact, skin absorption.

HEALTH HAZARD DATAISIGNS AND SYMPTOMS OF EXPOSURE:

ACUTE:

Skin: Corrosive to living tissue and is absorbed through the skin causing systemic poisoning. Contact with unprotected skin can cause discoloration, irritation, blistering and slow healing chemical burns.

Eyes: Contact with liquid may cause severe chemical burns and produce permanent damage.

Inhalation: May result in severe respiratory irritation; gastrointestinal distress (nausea, vomiting), central nervous system depression (headache, drowsiness, dizziness, confusion) and tingling or numbness of the extremities. Severe exposures may lead to respiratory failure, coma and death.

Ingestion: May produce burning pain in the mouth and stomach, severe abdominal pain with nausea, vomiting, slow respiration and irregular pulse. Symptoms similar to those for inhalation also may occur.

CHRONIC:

Exposure to high concentrations may lead to damage to the liver, kidneys and lungs. Contact with skin may cause dermatitis, gastrointestinal disorders and produce symptoms similar to those for inhalation.

OTHER POTENTIAL HEALTH HAZARDS:

Dipropylene glycol methyl ether is a mild allergen.

MEDICAL CONDITIONS
AGGRAVATED BY

EXPOSURE:

Individuals with pre-existing liver, kidney, lung or cardiovascular dysfunction may have increased susceptibility to the effects of exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY:

Naphthalene is an experimental tumorigen. Mutagenic data exists and Naphthalene is included in EPA Genetic Toxicology Program. Oleic acid is an experimental tumorigen.

SECTION VII - EMERGENCY AND FIRST AID PROCEDURES

EYES: For direct contact, flush eyes with clean water for 20 minutes lifting upper and lower lids occasionally.

Consult physician if irritation persists. If irritation or redness from exposure to vapors or mists develop,

move victim away from exposure and into fresh air.

SKIN: Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and

persists, consult a physician.

WGESTION: Aspiration hazard. If conscious, dilute with 4 to 8 ounces of water and seek immediate medical

attention. DO NOT induce vomiting.

INHALATION: Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if

respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if

necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL

PROCEDURES: Ventilate area and avoid breathing vapors. Absorb spill with oil absorbent or soda ash. Catch and

collect for recovery as soon as possible. Shovel into closable container for disposal. Wear protective

equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL

METHODS: Dispose in accord

Dispose in accordance with Federal, State and local regulations. Contact Safety-Kleen regarding

recycling.

HANDLING PROCEETION

PRECAUTIONS: Keep away from heat, sparks and open flames. Use adequate ventilation. Avoid contact with skin, eyes

and clothing. Avoid breathing vapors.

SHIPPING AND

STORING

PERSONAL

PRECAUTIONS: Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or

expose containers to flame or other sources of ignition. Keep container tightly closed when not in use

and during transport.

YGIENE: Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating,

drinking or using tobacco products.

SECTION IX - CONTROL MEASURES

VENTILATION:

Provide local exhaust or general dilution ventilation, as determined necessary, to maintain

concentrations of vapors below applicable exposure limits.

PROTECTIVE GLOVES:

Wear neoprene gloves to prevent skin contact.

EYE PROTECTION:

Where there is a likelihood of contact with the face and/or eyes, wear a faceshield and

chemical goggles. Contact lenses should not be worn.

RESPIRATORY PROTECTION:

Use NIOSH-approved respiratory protective equipment when concentration of vapors exceeds applicable exposure limit. Depending on the airborne concentration, use a respirator or gas mask with appropriate cartridges or canisters (for organic vapors). A self-contained breathing apparatus (SCBA) is required for large spills and emergencies. Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry

Standard 29 CFR 1910.134 - Respiratory Protection.

OTHER PROTECTIVE

EOUIPMENT:

A source of clean water should be available in the work area for flushing eyes and skin. Wear solvent-resistant boots, apron or other protective clothing where spills or splashes are possible.

SECTION X -- OTHER REGULATORY INFORMATION

DOT PROPER

SHIPPING NAME:

Compound, Cleaning Liquid

DOT CLASS:

Corrosive Liquid

DOT ID NUMBER:

NA1760

SARA TITLE III:

Product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Toxic constituents are listed with an asterisk in Section II of this Material Safety Data Sheet.

Product poses the following physical and/or health hazard(s) as defined in 40 CFR 370.3 (Sections 311, 312 of SARA Title III):

> Immediate (Acute) Health Hazard Delayed (Chronic) Health Hazard

Fire Hazard Reactivity Hazard

SECTION XI -- PREPARATION INFORMATION

PREPARED BY:

SK Technical Services

FORM NO. 900-14-057

ORIGINAL ISSUE DATE: December 1, 1989

REVISED: April 6, 1990

SUPERSEDES: December 1, 1989

User assumes all risks incident to the use of this product. To the best of our knowledge, the information contained herein is accurate. However, Safety-Kleen assumes no liability whatsoever for the accuracy or completeness of the information contained herein. No representations or warranties, either express or implied, or merchantability, fitness for a particular purpose or of any other nature are made hereinder with respect to information or the product to which information refers. The data contained on this sheet applies to the material as supplied to the user.

SAFETY-KLEEN 140 SOLVENT-MS MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123 For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE

MEDICAL:

TRANSPORTATION:

These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above. 800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS) 800/424-9300 CHEMTREC

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ACCITH

IDENTITY (TRADE NAME):

SAFETY-KLEEN 140 SOLVENT-MS

SYNONYMS:

PETROLEUM DISTILLATES, PETROLEUM NAPHTHA

SK PART NUMBER:

6616

FAMILYICHEMICAL NAME:

HYDROCARBON SOLVENT

PRODUCT USAGE:

SOLVENT FOR CLEANING AND DEGREASING PARTS

SECTION II - HAZARDOUS COMPONENTS

NAME	SYNONYM	%	CAS <u>NO</u> .	PEL (ppm)	TLV (ppm)
Mineral Spirits	Petroleum Distillates	99.9	64742-88-7	100 (Stoddard Solvent)	100 (Stoddard Solvent)
^e Dye (contains Xylene)		.003	1330-20-7	100 150 STEL	100 150 STEL
*Anti-Static Agent (contains Xylene)		0.0001	1330-20-7	100 150 STEL	100 150 STEL

^{*} See Section X - Other Regulatory Information

SECTION III -- PHYSICAL DATA

PHYSICAL STATE.

APPEARANCE AND ODOR:

Combustible liquid - clear, green, with characteristic hydrocarbon odor.

BOILING POINT:

360° - 400° F

MELTING POINT:

Not Available

EVAPORATION RATE:

(Butyl Acetate = 1) 0.08

PERCENT VOLATILE:

99.9%

VAPOR DENSITY:

5.48 (Air = 1)

VAPOR PRESSURE:

0.5 mm of Hg at 68° F

SOLUBILITY IN WATER:

Negligible

pH!

Not Applicable

SPECIFIC GRAVITY:

0.770 to 0.811

MOLECULAR WEIGHT:

Approximately 142

VOLATILE ORGANIC COMPOUNDS:

770 g/L

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT:

140° F (TCC)

AUTOIGNITION

TEMPERATURE:

473° F

CONDITIONS OF

FLAMMABILITY:

Materials must be moderately heated before ignition can occur.

FLAMMABLE LIMITS IN AIR - LOWER:

1.0%

UPPER: 7.0%

EXTINGUISHING MEDIA:

Carbon dioxide, foam, dry chemical, water (mist only).

FIRE FIGHTING PROCEDURES -- SPECIAL: NFPA 704 Rating 0-2-0

DJ -- DI ECIAL 141 IA IA IA IA IA

Keep storage tanks cool with water spray. Use self-contained breathing

apparatus (SCBA).

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Decomposition and combustion products may be toxic. Heated tanks may

rupture, explode or be thrown into the air. Vapors are heavier than air and may travel great distances to ignition source and flashback.

HAZARDOUS COMBUSTION PRODUCTS:

Thermal decomposition and burning may produce carbon monoxide.

SECTION V -- REACTIVITY DATA

STABILITY:

Normally stable even under fire exposure conditions and is not reactive with

water. Normal firefighting procedures may be used.

INCOMPATIBILITY

(CONDITIONS TO AVOID):

Strong oxidizing agents (e.g. chlorine, peroxides, strong acids).

HAZARDOUS

POLYMERIZATION:

Not known to occur under normal conditions.

HAZARDOUS DECOMPOSITION

PRODUCTS:

Normally none; however, incomplete burning may yield carbon monoxide.

SECTION VI - HEALTH HAZARD DATA

PRIMARY ROUTES

OF EXPOSURE:

Skin and eye contact; inhalation.

HEALTH HAZARD DATA/SIGNS AND SYMPTOMS OF EXPOSURE:

ACUTE:

Skin: Prolonged or repeated contact tends to remove skin oils, possibly leading to irritation and dermatitis.

No significant skin absorption hazard.

Eyes: Contact may cause slight to moderate irritation. High vapor concentrations (> 500 ppm) are

irritating to the eyes.

Inhalation: High concentrations of vapor or mist may be irritating to the respiratory tract, cause headaches, dizziness, nausea, impaired coordination, anesthesia anesthetic and may have other central nervous system effects.

Ingestion: Low order of acute oral toxicity. May cause irritation of the throat, nausea, vomiting and symptoms of central nervous system depression. Aspiration into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.

CHRONIC:

Prolonged and/or repeated contact may cause drying and cracking of the skin or dermatitis.

OTHER POTENTIAL HEALTH HAZARDS:

None Known

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Individuals with pre-existing central nervous system dysfunction may have increased susceptibility to the effects of exposure. Contact with skin may aggravate pre-existing

dermatitis.

CARCINOGENICITY:

None of the ingredients are known or suspected carcinogens.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES: For direct contact, flush eyes with water for 15 minutes lifting upper and lower lids occasionally.

Consult physician if irritation or pain persists. If irritation or redness from exposure to vapors or

mists develop, move victim away from exposure into fresh air.

SKIN: Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and

persists, consult a physician.

If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT INGESTION:

induce vomiting.

Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical NHALATION:

attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL

PROCEDURES: Remove all ignition sources. Ventilate area and avoid breathing vapors. For large spills, isolate

area and deny entry. If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closable container for disposal. Wear protective equipment

specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL

METHODS: Dispose in accordance with Federal, State, and local regulations. Contact Safety-Kleen regarding

recycling.

HANDLING

Avoid contact with eyes, skin or clothing. Use in well ventilated area and avoid breathing vapors **PRECAUTIONS:**

or mists. Keep away from heat, sparks and open flames.

SHIPPING AND

STORING

PRECAUTIONS: Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind

or expose containers to flame or other sources of ignition. Keep container tightly closed when not

in use and during transport.

PERSONAL HYGIENE:

Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco products. Launder contaminated clothing and clean protective

equipment before reuse.

SECTION IX -- CONTROL MEASURES

VENTILATION:

Provide local exhaust or general dilution ventilation as determined necessary to maintain concentrations of vapors or mists below applicable exposure limits. Where explosive mixtures

may be present, systems safe for such locations should be used.

PROTECTIVE

GLOVES:

Use nitrile or neoprene gloves to prevent contact with skin.

EYE

PROTECTION:

Where there is likelihood of spill or splash, wear chemical goggles or faceshield. Contact lenses

should not be worn.

RESPIRATORY

PROTECTION:

Use NIOSH-approved respiratory protective equipment when concentration of vapors or mists exceeds applicable exposure limit. Depending on the airborne concentration, use a respirator or gas mask with appropriate cartridges and canisters (for organic vapor with mist prefilter). A selfcontained breathing apparatus (SCBA) is required for large spills and emergencies. Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry

Standard 29 CFR 1910.134 - Respiratory Protection.

OTHER PROTECTIVE

EQUIPMENT:

Wear solvent-resistant boots, apron or other protective clothing where spills and splashes are possible. A source of clean water should be available in work areas for flushing the eyes and skin.

SECTION X -- OTHER REGULATORY INFORMATION

DOT PROPER

SHIPPING NAME:

Petroleum Naphtha

DOT CLASS:

Combustible Liquid

DOT NUMBËR:

UN 1255

SARA TITLE III:

Product does not contain a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Product poses the following physical and/or health hazard(s) as defined in 40 CFR 370.3 (Sections 311, 312 of SARA Title III):

Immediate (Acute) Health Hazard Delayed (Chronic) Health Hazard

Fire Hazard

SECTION XI - PREPARATION INFORMATION

PREPARED BY:

SK Product Review Committee

FORM NO. 900-14-004

REVISED: December 1, 1989 SUPERSEDES: July 20, 1989 ORIGINAL ISSUE DATE: July 20, 1989

User assumes all risks incident to the use of this product. To the best of our knowledge, the information contained herein is accurate. However, Safety-Kleen assumes no liability whatsoever for the accuracy or completeness of the information contained herein. No representations or warrantes, either express or implied, or merchantability, fitness for a particular purpose or of any other nature are made hereinder with respect to information or the product to which information refers. The data contained on this sheet applies to the material as supplied to the user.

SAFETY-KLEEN MULTI-USE LACQUER THINNER 6801 MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123 For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE

MEDICAL:

TRANSPORTATION:

These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.

800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS) 800/424-9300 CHEMTREC

IDENTITY (TRADE NAME):

SAFETY-KLEEN MULTI-USE LACQUER THINNER 6801

SK PART NUMBER:

6801

FAMILY/CHEMICAL NAME:

N/A

PRODUCT USAGE:

LACQUER THINNER

SECTION II -- HAZARDOUS COMPONENTS

NAME	SYNONYM	<u>%</u>	CAS NO.	OSHA PEL (ppm)	ACGIH TLV (ppm)
Colucte	Toluol	11-43	108-88-3	100 150 STEL	100 150 STEL
*Xylene	Xylol	3-4	1330-20-7	100 150 STEL	100 150 STEL
^e Methyl Ethyl Ketone	MEK	~5	78-93-3	200 300 STEL	200 300 STEL
*Methyl Isobutyl Ketone	MIBK	~3	108-10-1	50 75 STEL	50 75 STEL
*Acetone	2-Propanone	20-30	67- 64 -1	750 1000 STEL	750 1000 STEL
*Isopropanol	isopropyl Alcohol	5-15	67-63-0	400 500 STEL	400 500 STEL
Special Lactol Spirits	VM & P Naphtha	0.5-32	8030-30-6	300 400 STEL	300 STEL
Isobutyl Acetate	Isobutyl Ester Acetic Acid	0.1-15	110-19-0	150	150
Ethyl 3-Ethoxypropionate	3-Ethoxypropionic Acid Ethyl Ester	~5	763-69-9	N/E	N/E

N/E = Not Established

SECTION III - PHYSICAL DATA

PHYSICAL STATE.

APPEARANCE AND ODOR:

Liquid - colorless, clear, with a characteristic solvent odor.

POILING POINT:

~131 - 347º F

MELTING POINT:

Not Applicable

EVAPORATION RATE:

3.30 (N-Butyl = 1)

See Section X - Other Regulatory Information

PERCENT VOLATILE:

100%

VAPOR DENSITY:

3.02 (Air = 1)

VAPOR PRESSURE:

78.6 mm Hg @ 20° C

SOLUBILITY IN WATER:

Appreciable

pH:

Not Applicable

SPECIFIC GRAVITY:

 $\sim 0.8000 - 0.8438$ (Water = 1)

MOLECULAR WEIGHT:

Use molecular weight of individual components.

VOLATILE ORGANIC COMPOUNDS:

800 - 844 g/L

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT:

<20° F(TCC)

AUTOIGNITION TEMPERATURE:

Not Available

CONDITIONS OF FLAMMABILITY:

Normal temperatures and pressures.

FLAMMABLE LIMITS IN AIR - LOWER:

1.0%

UPPER: 13.2%

EXTINGUISHING MEDIA:

Carbon dioxide, foam, dry chemical, water (mist only)

FIRE FIGHTING PROCEDURES - SPECIAL:

NFPA 704 Rating 2-3-0

Water may be used to cool containers and fire fighters. However, water could cause free

solvent to float and spread fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Flammable liquid. Most components are Class 1B with flash point below 73° F and

boiling point above 100° F.

HAZARDOUS COMBUSTION PRODUCTS:

Carbon Monoxide

SECTION V -- REACTIVITY DATA

STABILITY:

Stable under normal temperatures and conditions.

INCOMPATIBILITY:

(CONDITIONS TO AVOID)

Heat sparks, flames, fire, strong oxidizing agents.

HAZARDOUS

POLYMERIZATION:

Not known to occur under normal conditions.

HAZARDOUS DECOMPOSITION

PRODUCTS:

Normally none. Incomplete burning may yield carbon monoxide.

SECTION VI - HEALTH HAZARD DATA

PRIMARY ROUTES

OF EXPOSURE:

Inhalation, skin and eye contact.

HEALTH HAZARD DATA/SIGNS AND SYMPTOMS OF EXPOSURE:

ACUTE:

Skin: Contact may cause irritation, dryness and cracking. Prolonged or repeated contact may remove skin oils. possibly leading to irritation and dermatitis. Material is readily absorbed through skin.

Eyes: Direct contact may cause severe irritation and temporary corneal damage. Vapors may cause noticeable redness, tearing, irritation and pain. Conjunctivitis may occur upon chronic exposure.

Inhalation: Can cause headache, dizziness, confusion, nausea, vomiting, irritation of the respiratory system and other central nervous system effects including unconsciousness in extreme cases.

Ingestion: Can cause burning of the mouth, throat and abdomen, nausea, vomiting, diarrhea, symptoms of the central nervous system depression, including weakness, dizziness, slow and shallow respiration, unconsciousness and convulsions. Aspiration into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possible death.

CHRONIC:

Inhalation: Prolonged overexposure may cause damage to the liver, kidney, spleen, lungs or nervous system.

OTHER POTENTIAL HEALTH HAZARDS:

Reports have associated prolonged and repeated occupational exposure to solvents with permanent brain and/or central nervous system damage. Intentional misuse by deliberately concentrating and inhaling this material may be harmful or fatal. Observe all appropriate control measures.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Individuals with pre-existing liver, kidney, spleen, lungs, skin or nervous system dysfunction may have increased susceptibility to the effects of the exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY: No components are known or suspected carcinogens.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES:

For direct contact, flush eyes with clean water for 15 minutes lifting upper and lower lids occasionally. Consult physician if irritation persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure and into fresh air.

SKIN:

Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and persists, consult a physician.

INGESTION:

Aspiration hazard. If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION:

Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL

PROCEDURES:

Remove all ignition sources. Isolate area and deny entry. If possible, contain as a liquid for possible recycling. Absorb onto sand or other absorbent material. Shovel into closable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL

METHODS:

Dispose in accordance with Federal, State and local regulations. Contact Safety-Kleen regarding recycling.

HANDLING

PRECAUTIONS:

Do not get into eyes, on skin or clothing. Avoid breathing vapors. DO NOT smoke when handling this product.

SHIPPING AND STORING RECAUTIONS:

Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

PERSONAL HYGIENE:

Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco products.

Safety-Kleen Multi-Use Lacquer Thinner 6801 - Page 3 of 4

SECTION IX - CONTROL MEASURES

VENTILATION:

Provide local exhaust or general dilution ventilation as determined necessary, when concentrations of

vapors exceed applicable exposure limits. Where explosive mixtures may be present, systems safe for

such locations should be used.

PROTECTIVE

GLOVES:

To protect against contact with skin, wear nitrile gloves.

EYE

PROTECTION:

Where there is likelihood of eye contact, wear chemical goggles. Contact lenses should not be worn.

RESPIRATORY

PROTECTION:

Use NIOSH-approved respiratory protective equipment when concentration of vapors exceeds applicable exposure limit. Depending on the airborne concentration, use a respirator or gas mask with appropriate cartridges and canisters (for organic vapors). A self-contained breathing apparatus (SCBA) is required for large spills and emergencies. Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry Standard 29 CFR 1910.134 - Respiratory

Protection.

OTHER PROTECTIVE

EQUIPMENT:

A source of clean water should be available in the work area for flushing eyes and skin. Wear rubber

apron or other protective clothing as needed to protect against spills or splash.

SECTION X -- OTHER REGULATORY INFORMATION

DOT PROPER SHIPPING NAME:

Paint-Related Material

DOT CLASS:

Flammable Liquid

DOT ID NUMBER:

NA1263

SARA TITLE III:

Product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Toxic constituents are listed with an asterisk in Section II

of this Material Safety Data Sheet.

Product poses the following physical and/or health hazard(s) as defined in

40 CFR 370.3 (Sections 311, 312 of SARA Title III):

Immediate (Acute) Health Hazard Delayed (Chronic) Health Hazard

Fire Hazard

SECTION XI - PREPARATION INFORMATION

PREPARED BY:

SK Product Review Committee

FORM NO. 900-14-056

ORIGINAL ISSUE DATE: July 20, 1989 REVISED: December 1, 1989

SUPERSEDES: July 20, 1989

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SAFETY-KLEEN HEAVY DUTY LACQUER THINNER 6782 MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123 For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE

MEDICAL:

TRANSPORTATION:

These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.

800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS) 800/424-9300 CHEMTREC

IDENTITY (TRADE NAME):

SAFETY-KLEEN HEAVY DUTY LACQUER THINNER 6782

SK PART NUMBER:

5820, 5825

FAMILY/CHEMICAL NAME:

N/A

PRODUCT USAGE:

LACQUER THINNER

SECTION II -- HAZARDOUS COMPONENTS **OSHA** ACGIH PEL CAS TLV NAME SYNONYM NO. <u>4</u> (ppm) (ppm) 5-60 oluene Toluol 108-88-3 100 100 150 STEL 150 STEL 100 *Xylene 1330-20-7 **Xylol** 5-20 100 150 STEL 150 STEL . Heptane n-Heptane N/E 142-82-5 400 500 STEL 500 STEL *Methyl Ethyl MEK 5-40 78-93-3 200 Ketone 300 STEL 300 STEL Methyl Isobutyl **MIBK** 0.1-10 108-10-1 50 75 STEL 50 75 STEL Ketone Methylcyclohexane 0.10-40 108-87-2 400 400 Cyclohexylmethane *Acetone 2-20 67-64-1 2-Propanone 750 1000 STEL 1000 STEL Cyclohexane 110-82-7 300 300 logropanol* Isopropyl Alcohol 0.1-20 67-63-0 500 STEL 500 STEL Methanol Methyl Alcohol 2-10 67-56-1 200 250 STEL 250 STEL **Lactol Spirits** 8030-30-6 VM & P Naphtha 0.1-20 300 300 400 STEL Ethanol Ethyl Alcohol 0.1-10 64-17-5 1000 1000 n-Butyl Acetate 150 **Butyl Acetate** 0.1-15 123-86-4 150 200 STEL 200 STEL Isoburyl Acetate Isobutyl Ester 0.1-15 110-19-0 150 150 Acetic Acid 3-Ethoxypropionate 3-Ethoxypropionic Acid Ethyl Ester N/E 763-69-9 N/E N/E

N/E = Not Established

* See Section X - Other Regulatory Information

SECTION III -- PHYSICAL DATA

PHYSICAL STATE.

APPEARANCE AND ODOR:

Liquid - colorless, clear, with a characteristic solvent odor.

BOILING POINT:

~131 - 347° F

MELTING POINT:

Not Applicable

EVAPORATION RATE:

3.68 (N-Butyl = 1)

PERCENT VOLATILE:

100%

VAPOR DENSITY:

3.02 (Air = 1)

VAPOR PRESSURE:

94.7 mm Hg @ 20 ° C

SOLUBILITY IN WATER:

Appreciable

pH:

Not Applicable

SPECIFIC GRAVITY:

 ~ 0.802 (Water = 1)

MOLECULAR WEIGHT:

Use molecular weight of individual components.

VOLATILE ORGANIC COMPOUNDS:

802 g/L

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT:

< 20° F (TCC)

AUTOIGNITION TEMPERATURE:

Not Available

CONDITIONS OF FLAMMABILITY:

Normal temperatures and pressures.

FLAMMABLE LIMITS IN AIR - LOWER:

1.0%

UPPER: 13.2%

EXTINGUISHING MEDIA:

Carbon dioxide, foam, dry chemical, water (mist only)

FIRE FIGHTING PROCEDURES -- SPECIAL:

NFPA 704 Rating 2-3-0

Water may be used to cool containers and firefighters. However, water could cause free solvent to float and spread fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Flammable liquid. Most components are Class 1B with flash point below 73°F and boiling point above 100°F.

HAZARDOUS COMBUSTION PRODUCTS:

Carbon Monoxide

SECTION V -- REACTIVITY DATA

STABILITY:

Stable under normal temperatures and conditions.

INCOMPATIBILITY:

(CONDITIONS TO AVOID)

Heat sparks, flames, fire, strong oxidizing agents.

HAZARDOUS

POLYMERIZATION:

Not known to occur under normal conditions.

HAZARDOUS DECOMPOSITION

PRODUCTS:

Normally none. Incomplete burning may yield carbon monoxide.

SECTION VI - HEALTH HAZARD DATA

PRIMARY ROUTES OF EXPOSURE:

Inhalation, skin and eye contact.

HEALTH HAZARD DATA/SIGNS AND SYMPTOMS OF EXPOSURE:

ACUTE:

Skin: Contact may cause irritation, dryness and cracking. Prolonged or repeated contact may remove skin oils, possibly leading to irritation and dermatitis. Material is readily absorbed through skin.

Eyes: Direct contact may cause severe irritation and temporary corneal damage. Vapors may cause noticeable redness, tearing, irritation and pain. Conjunctivitis may occur upon chronic exposure.

Inhalation: Can cause headache, dizziness, confusion, nausea, vomiting, irritation of the respiratory system and other central nervous system effects including unconsciousness in extreme cases.

Ingestion: Can cause burning of the mouth, throat and abdomen, nausea, vomiting, diarrhea, symptoms of the central nervous system depression, including weakness, dizziness, slow and shallow respiration, unconsciousness and convulsions. Aspiration into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possible death.

CHRONIC:

Inhalation: Prolonged overexposure may cause damage to the liver, kidney, spleen, lungs or nervous system.

OTHER POTENTIAL HEALTH HAZARDS:

Reports have associated prolonged and repeated occupational exposure to solvents with permanent brain and/or central nervous system damage. Intentional misuse by deliberately concentrating and inhaling this material may be harmful or fatal. Observe all appropriate control measures.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Individuals with pre-existing liver, kidney, spleen, lungs, skin or nervous system dysfunction may have increased susceptibility to the effects of the exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY: No components are known or suspected carcinogens.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES:

For direct contact, flush eyes with clean water for 15 minutes lifting upper and lower lids occasionally. Consult physician if irritation persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure and into fresh air.

SKIN:

Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and persists, consult a physician.

INGESTION:

Aspiration hazard. If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION:

Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL

PROCEDURES:

Remove all ignition sources. Isolate area and deny entry. If possible, contain as a liquid for possible recycling. Absorb onto sand or other absorbent material. Shovel into closable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS:

Dispose in accordance with Federal, State and local regulations. Contact Safety-Kleen regarding recycling.

ANDLING PRECAUTIONS:

Do not get into eyes, on skin or clothing. Avoid breathing vapors. DO NOT smoke when handling this product.

SHIPPING AND STORING PRECAUTIONS:

Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or

expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

PERSONAL HYGIENE:

Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco products.

SECTION IX - CONTROL MEASURES

VENTILATION:

Provide local exhaust or general dilution ventilation as determined necessary, when concentrations of vapors exceed applicable exposure limits. Where explosive mixtures may be present, systems safe for

such locations should be used.

PROTECTIVE GLOVES:

To protect against contact with skin, wear nitrile gloves.

EYE

PROTECTION:

Where there is likelihood of eye contact, wear chemical goggles. Contact lenses should not be worn.

RESPIRATORY PROTECTION:

Use NIOSH-approved respiratory protective equipment when concentration of vapors exceeds applicable exposure limit. Depending on the airborne concentration, use a respirator or gas mask with appropriate cartridges and canisters (for organic vapors). A self-contained breathing apparatus (SCBA) is required for large spills and emergencies. Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry Standard 29 CFR 1910.134 - Respiratory

Protection.

OTHER PROTECTIVE EQUIPMENT:

A source of clean water should be available in the work area for flushing eyes and skin. Wear rubber apron or other protective clothing as needed to protect against spills or splash.

SECTION X -- OTHER REGULATORY INFORMATION

DOT PROPER

SHIPPING NAME:

Paint-Related Material

DOT CLASS:

Flammable Liquid

DOT ID NUMBER:

NA1263

SARA TITLE III:

Product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Toxic constituents are listed with an asterisk in Section II of this Material Safety Data Sheet.

Product poses the following physical and/or health hazard(s) as defined in 40 CFR 370.3 (Sections 311, 312 of SARA Title III):

Immediate (Acute) Health Hazard Delayed (Chronic) Health Hazard Fire Hazard

SECTION XI - PREPARATION INFORMATION

PREPARED BY:

SK Product Review Committee

FORM NO. 900-14-055

ORIGINAL ISSUE DATE:

July 20, 1989

REVISED: December 1, 1989

SUPERSEDES: July 20, 1989

User assumes all risks incident to the use of this product. To the best of our knowledge, the information contained herein is accurate. However, Safety-Kleen assumes no liability whatsoever for the accuracy or completeness of the information contained herein. No representations or warranties, either express or implied, or merchantability, fitness for a particular purpose or of any other nature are made hereunder with respect to information or the product to which information refers. The data contained on this sheet applies to the material as supplied to the user.

SAFETY-KLEEN PERCHLOROETHYLENE MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123 For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE

MEDICAL:

TRANSPORTATION:

These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number

800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS)

800/424-9300 CHEMTREC

IDENTITY (TRADE NAME):

Head above.

SAFETY-KLEEN PERCHLOROETHYLENE

SK PART NUMBER:

775, 778, 10778, 30778

FAMILYICHEMICAL NAME:

CHLORINATED HYDROCARBON

PRODUCT USAGE:

DRY CLEANING SOLVENT

SECTION II - HAZARDOUS COMPONENTS

100

OSHA

NAME SYNONYM

CAS NO. PEL (mm) (TEEN)

Perchléresthyleine (Stabiliséd) 1.122 - Tem-

127-18-4

25

50 200 STEL

SECTION III - PHYSICAL DATA

PHYSICAL STATE,

APPEARANCE AND ODOR:

Liquid - colorless, clear liquid with mildly sweet odor.

BOILING POINT:

250° F

MELTING POINT:

.90 F

EVAPORATION RATE:

0.09 (Taluene = 1)

PERCENT VOLATILE:

Approximately 100%

VAPOR DENSITY:

5.83

VAPOR PRESSURE:

13 mm Hg @ 20° C (Concentrate)

SOLUBILITY IN WATER:

0.015 mg/100 gm @ 25° C

-*U* •

Not Applicable

SPECIFIC GRAVITY:

1.6 (Water = 1.0)

MOLECULAR WEIGHT:

164

VOLATILE ORGANIC COMPOUNDS:

None

^{*} See Section X - Other Regulatory Information

CHRONIC:

Prolonged and repeated exposure to high concentrations may result in damage to the liver, kidneys and central nervous system. Prolonged or repeated contact with skin may cause skin to become readened. rough and dry and may result in dermanus.

OTHER POTENTIAL HEALTH HAZARDS:

Animals exposed to high levels have shown cardiac sensitization.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

> Individuals with pre-existing liver, kidney or central nervous system dysfunction may have increased susceptibility to effects of the exposure. Contact with skin may aggravate pre-existing dermanns.

CARCINOGENICITY: Perchloroethylene is listed by OSHA, NTP and IARC as a suspected carcinogen.

SECTION VII - EMERGENCY AND FIRST AID PROCEDURES

EYES:

Flush eyes with water for 20 minutes lifting upper and lower lids occasionally. Consult physician if irritation persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure and into fresh air.

SKIN:

Remove comminsted clothing. Wash skin twice with soap and water. If irritation persists consult a physician.

INGESTION:

Aspiration hazard. If conscious, dilute with 4 to 8 ounces of water and seek immediate medical

attention. DO NOT induce vomining.

INHALATION:

Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if breathing has stopped. Do not leave victim unattended. Seek immediate medical

attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE HANDLING AND LISE

SPILL

PROCEDURES:

Isolate area and deay entry. Ventilete area and avoid breathing vapors. Absorb onto send or other absorbest meserial. Shovel into closable commisser for disposal. West projective comment specified below. Commin away from surface waters and sewers.

WASTE DISPOSAL METHODS:

Dispose in accordance with Federal, State and local regulations. Connect Safety-Kleen resenting recycling.

HANDLING PRECAUTIONS:

Do not get into eyes, on skin or clothing. Avoid breathing vapors. DO NOT smoke when using this product.

SHIPPING AND STORING PRECAUTIONS:

Empty product comminers may contain product residue. Do not pressurize, cut, best, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport. Because vapors are much heavier than air, do not store in basements. pies or depressions without ventilation at floor level.

PERSONAL HYGIENE:

Use good personal hygiene. Wash thoroughly with soap and water after handling and before earing, drinking or using tobacco products. Clothing which becomes soaked with solvent should he removed immediately and must not be worn until it is thoroughly laundered and dried.

SAFETY-KLEEN DRY CLEANING GRADE SOLVENT F 780 MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123 For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE

MEDICAL:

TRANSPORTATION:

Their numbers are for emergency use only. If you desire non-emergency information about this preduct, please call the telephone number listed above. 800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS) 800/424-9300 CHEMTREC

1250 STEL

IDENTITY (TRADE NAME):

SAFETY-KLEEN DRY CLEANING GRADE SOLVENT F 780

SK PART NUMBER:

780

FAMILY/CHEMICAL NAME:

CHLORINATED/FLUORINATED HYDROCARBON

PRODUCT USAGE:

DRY CLEANING SOLVENT

SECTION II - HAZARDOUS COMPONENTS

NAMÉ	SYNONYM	5	NO.	PEL (mm)	(mar)
Trichloroun(luoroushana	Flurocarbon 113	- 100	76-13-1	1000	1000

^{*} See Section X - Other Regulatory Information

SECTION III - PHYSICAL DATA

PHYSICAL STATE.

APPEARANCE AND ODOR:

Liquid - clear, colorless liquid with slight ethereal odor.

BOILING POINT:

117.6º F

MELTING POINT:

Not Applicable

EVAPORATION RATE:

 $0.1 (CCL_{\epsilon} = 1)$

PERCENT VOLATILE:

100%

VAPOR DENSITY:

6.5 (Air = 1)

VAPOR PRESSURE:

334 mm Hr @ 77° F

SOLUBILITY IN WATER:

0.02% by weight (77° F)

pH:

Not Applicable

SPECIFIC GRAVITY:

1.57 (Water = 1, @ 77° F)

MOLECULAR WEIGHT:

187

VOLATILE ORGANIC COMPOUNDS:

None

OTHER POTENTIAL HEALTH HAZARDS:

None Known

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

> Individuals with pre-existing lung, skin and cardiovascular system dysfunction may have increased susceptibility to effects of the exposure. Contact with skin may aggravate pre-existing demautis.

CARCINOGENICITY:

No components are listed by OSHA, NTP or IARC as known or suspected carcinogens.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES:

Flush eyes with water for 20 minutes lifting upper and lower lide occasionally. Consult physician if irritation persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure and into fresh air.

SKIN:

Remove contaminated clothing. Wash skin twice with soap and water. If irritation persists, consult a physician.

INGESTION:

Aspiration hazard. If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION:

Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if breathing has stopped. Do not leave victim unamended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE HANDLING AND USE

SPILL.

PROCEDURES:

Isolate area and deay entry. Ventilate area and avoid breathing vapors. Remove residue with inert sorbent such as sand, oil dry or other absorbent material. Shovel into closable commer for disposal. Wear protective equipment specified below. Contain away from surface waters and SCWEEK.

WASTE DISPOSAL

METHODS:

Dispose in accordance with Federal, State and local regulations. Contact Safety-Kleen regarding recycling.

HANDLING

PRECAUTIONS:

Do not get into eyes, on skin or clothing. Avoid breathing vapors or mists.

SHIPPING AND STORING

PRECAUTIONS:

Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or expose comminers to flame or other sources of ignition. Keep container tightly closed when not

in use and during transport. Do not store above 125° F.

PERSONAL.

HYGIENE:

Use good personal hygiene. Wash thoroughly with soon and water after handling and before casing, drinking or using sobacco products.

SECTION IX - CONTROL MEASURES

VENTILATION:

Provide local exhaust or general dilution ventilation as determined necessary to maintain

concentrations of vapors below applicable exposure limits.

PROTECTIVE GLOVES:

Wear neoprene or nitrile gloves for repeated or prolonged connect.

FYF

Where there is likelihood of spill or splesh, were chemical gogyles or faceshield. Contact lenses PROTECTION:

should not be wors.

Recycled Perchloroethylene for Dry Cleaning

Specifications

Physical Test	Specification 1.61 - 1.63		
Specific Gravity 20°C/20°C			
Pounds Per Gallon	13.4		
Appearance	Clear, Free of Sediment Suspended Material		
Golor, APHA	25 meximum		
Water, PPM	50 maximum		
Purity: Perchloroethylene by Volume & G.C.	99.5 sinimum		
Impurities: Other helogenated	.5% meximum		
Other hydrocarbons	.5t miximum		
Odoz	Characteristic; no residual		
Spot Test	No Spot or Stain		
Nonvolatile Residue, ppm	50 maximum ,.		
Acid Acceptance	.02 meximum		

MATERIAL BAFETY DATA BHEET DHS08400

TCCUPATIONAL HEALTH BERVICES, INC.

to WEST 42ND STREET. 12TH FLOGR

. FOR EMERGENCY BOURCE INFORMAT-

___ CONTACT: 1-q:S-Tae-1960

.EW -OFF. MEW -OFF 10074

SUBSTANCE IDENTIFICATION

inte linge

CASHNUMBER 107-11-1 FTEC-NUMBER & WIRTERS

EUPSTANCE: ETHYLENE GLYCOL

TRADE NAMES/SYNONYMS:

1.2-DIHYDROXYETHANE: 1.2-ETHANESICL: ETHYLENE ALCOHOL: GLYCOL: GLYCOL ALCOHOL: MONOETHYLENE GLYCOL: DOWTHERM SR 1: ETHANE-1.2-DIGL: LUTROL-9: MACROGOL 400 BPC: M.E.J.: TESCOL: 2-HYDROXYETHANOL:

ETHYLENE DIHYDRATE: DOWTHERM SR: C24502: 0HS09400

CHEMICAL FAMILY: GL /COL

MOLECULAR FORMULA: H-O-C-H2-C-H2-O-H MOLECULAR WEIGHT: 62.07

CERCLA RATINGS (SCALE 0-3): HEALTH=1 FIRE=1 REACTIVITY=0 PERSISTENCE=0 NFPA SATINGS (SCALE 0-4): HEALTH-1 FIRE-1 REACTIVITY-0

COMPONENTS AND CONTAMINANTS

COMPONENT: ETHYLENE GLYCOL CAS# 107-21-1

PERCENT: 100

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:

ETHYLENE GLYCOL:

50 PPM (125 MG/M3) OSHA CEILING

50 PPM (125 MG/M3) ACGIH CEILING (VAPOR AND MIST)

SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: ODORLESS, COLORLESS, HYGROSCOPIC LIQUID WITH A SWEET TASTE.

BOILING POINT: 388 F (198 C)

MELTING POINT: 10 F (-12 C)

SPECIFIC GRAVITY: 1.1088

SOLUBILITY IN WATER: SOLUBLE

VAPOR DENSITY: 2.14

VAPOR PRESSURE: 0.05 MMHG @ 20 C

OTHER SOLVENTS (SOLVENT - SOLUBILITY): SOLUBLE IN ALCOHOL, ACETONE, GLYCEROL, ACETIC ACID, ALDEHYDES, KETONES, PYRIDINE: SLIGHTLY SOLUBLE IN ETHER: PRACTICALLY INSCLUBLE IN BENZENE, PETROLEUM ETHER, DILS. CHLORINATED HYDROCARBONS.

LILB: TIRO MGA S INTRAMUSCULAR-RAT LILD: 5500 MS - 6 INTRAMUSCULAR-RARS: LINI: 1507 MG/FG INREFORTED FOUTE-MAN NULDE:

MUTABENIE DATA PRIECED: REFRODUCTIVE EFFECTS DATA PRIECES:

APRINOGEN STATUS: NONE.

ICAL EFFECTS: IRRITANT- INHALATION, SKIM. EVE. TUTE TOXICITY LEVEL: MODERATELY TOXIC BY INGESTION: SLIGHTLY TOXIC BY IESMAL ABBORRTION.

TRANGET EFFECTS: CENTRAL NERVOUS SYSTEM DEFRESSANT: METHRETCKIN: NEUROTCKIN. ROTEONING MAY AFFECT THE LUNGS, HEART, BLOOD, BRAIN AND LIVER.

HEALTH EFFECTS AND FIRST AID

INHALATION: ETHYLENE GLYCOL: IRRITANT.

> ACUTE EXPOSURE- INHALATION IS UNLIKELY AT ROOM TEMPERATURE. DUE TO THE LOW VAPOR PRESSURE. AEROSOLS AT 140 MG/MJ WERE IRRITATING. AND 200 MG/MJ WEFE INTOLERABLE CAUSING A BURNING SENSATION OF THROAT AND COUGHING. EXPOSURE TO HIGH CONCENTRATIONS OF MISTS OR AEROSOLS MAY RESULT IN EFFECTS ON THE HEMATOFOIETIC SYSTEM AND CENTRAL NERVOUS SYSTEM WITH HEADACHE. DIZZINESS AND DROWSINESS.

CHRONIC EXPOSURE- HUMANS EXPOSED TO AEROSOLS FROM 3-67 MG/MJ CONTINUOUSLY FOR 1 MONTH REPORTED IRRITATION OF THE RESPIRATORY TRACT, OCCASIONALLY SLIGHT HEADACHE AND LOW BACKACHE, BUT NO OTHER SIGNIFICANT ADVERSE EFFECTS. CONTINUED EXPOSURE TO VAPORS FROM A PROCESS UTILIZING A MIXTURE OF ETHYLENE GLYCOL. BORIC ACID AND AMMONIA HEATED ABOVE 100 C RESULTED IN NYSTAGMUS. LYMPHOCYTOSIS AND SUDDEN LOSS OF CONSCIOUSNESS FOR 5-10 MINUTES. NYSTAGMUS OCCURRED 2-3 TIMES WEEKLY UNTIL EXPOSURE CEASED. REPEATED EXPOSURE TO SATURATED ETHYLENE GLYCOL VAPORS PRODUCED SLIGHT MARCOSIS IN RATS. EFFECTS ON THE FETUS HAVE BEEN REPORTED IN RATS AND MICE FOLLOWING EXPOSURE DURING GESTATION. THERE WAS A LIKELIHOOD THAT AT LEAST A PORTION OF THE EFFECTS RESULTED FROM INGESTION SINCE ANIMALS GROOMED CONSTANTLY BEFORE AND AFTER EXPOSURE.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED. PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT: ETHYLENE GLYCOL: IRRITANT.

ACUTE EXPOSURE- LIQUID MAY DEFAT THE SKIN AND CAUSE MINOR IRRITATION. ANIMAL STUDIES INDICATE THAT LETHAL AMOUNTS MAY BE ABSORBED THROUGH INTACT SKIN. ONE CASE HAS BEEN REPORTED OF COMA ACCOMPANIED BY MIOSIS AND SLOWED PULSE 4 HOURS AFTER MASSIVE APPLICATION OF AN ECZEMA REMEDY CONTAINING ETHYLENE GLYCOL. SENSITIZATION REACTIONS MAY OCCUR IN PREVIOUSLY EXPOSED PERSONS. CHRONIC EXPOSURE- A SLIGHT MACERATING ACTION ON THE SKIN MAY RESULT FROM VERY SEVERE, PROLONGED EXPOSURE. REPEATED OR PROLONGED CONTACT MAY RESULT IN SENSITIZATION.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SDAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:

WHETHER THE BEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTICOTE WIS ACTUAL COSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

ETHYLEME GLYCOL FOISONING:

SINE ETHANCE, YOU 100 FROOF). 1.5 ML/FG GRALLY INITIALLY, DILUTED TO NOT MORE THAN EN ECLUTION, FOLLOWED BY 0.5-1.0 ML/FG EVERY I HOURS GRALLY OR INFAVENCUSLY FOR 4 DAYS TO FREVENT METABOLISM OF INGESTED ETHYLEME GLYCOLTI SKALATE, BLOOD ETHANOL LEVEL SHOULD BE IN THE RANGE 1-1.5 MG/ML. GIVE IALCIUM GLUCONATE, 10 ML OF 10% SOLUTION DILUTED IN 1 LITER OF 5% GLUCOSE. INTRAVENOUSLY AS NECESSARY TO MAINTAIN NORMAL SERUM CALCIUM LEVELS. CALCIUM ADMINISTRATION MAY CAUSE ANURIA DUE TO PRECIPITATION OF CALCIUM OXALATE IN

THE FIDNEYS (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). IN THE ABSENCE OF SENAL IMPAIRMENT, FORCE FLUIDS TO 4 LITERS DAILY TO INCREASE EYERETION OF SERFORM HEMODIALYSIS. ANTIDOTÉ SHOULD BE ADMINISTERED BY QUALIFIED MÉDITAL PERSONNEL.

GRAL OR INTRAVENOUS ADMINISTRATION OF 4-METHYLPYRAZOLE INHIBITS ALCOHOL DEHYDROGENASE AND HAS BEEN USED EFFECTIVELY AS AN ANTIDOTE FOR METHANOL OR ETHYLENE GLYCOL POISONING 'ELLENHORN AND BARCELOUX, MEDICAL TOXICOLOGY).

REACTIVITY SECTION

REACTIVITY:

STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:

ETHYLENE GLYCOL:

AMMONIUM DICHROMATE: IGNITES @ 100 C.

CHLOROSULFONIC ACID: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.

CHROMIUM TRIOXIDE: IGNITES ON CONTACT.

DIMETHYL TEREPHTHALATE + TITANIUM BUTOXIDE: POSSIBLE IGNITION.

OLEUM: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.

OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.

PERCHLORIC ACID: VIOLENT DECOMPOSITION.

FHOSPHORUS(V) SULFIDE: EXPLOSIVE REACTION ON HEATING.

POTASSIUM DICHROMATE: VIGOROUS EXOTHERMIC REACTION @ 100 C.

POTASSIUM PERMANGANATE: IGNITES ON CONTACT.

SILVER CHLORATE: IGNITES @ 100 C.

SILVERED COPPER WIRE: IGNITES.

SODIUM CHLORITE: IGNITES @ 100 C.

SODIUM HYDROXIDE: EXPLOSION HAZARD.

SODIUM PEROXIDE: IGNITES ON CONTACT.

SULFURIC ACID: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.

URANYL NITRATE: IGNITES @ 100 C.

DECOMPOSITION:

THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON.

FOLYMERIZATION:

HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

SELF-CONTAINED BREATHING AFFARATUS WITH A FULL FACEPIECE OPERATED IN FREESURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN FRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-SEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

SLOVES:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE FROTECTION:

EMPLOYEE MUST WEAR SPLASH-FFOOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE.

EMERGENCY EYE WASH: WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES. INC.

CREATION DATE: 04/24/85 REVISION DATE: 10/09/90

USED OIL MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123 For Product/Sales Information Cull 708/697-8460

EMERGENCY TELEPHONE

MEDICAL:

TRANSPORTATION:

These numbers are for emergency use unly. If you dealer non-emergency information about this product, please call the telephone number listed above.

800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS) 800/424-9300 CHEMTREC

IDENTITY (TRADE NAME):

USED OIL

SK PART NUMBER:

FAMILY/CHEMICAL NAME:

MIXED WASTE OILS

PRODUCT USAGE:

SUPPLEMENTAL FUEL

DRAFT

SECTION II - HAZARDOUS COMPONENTS

NAME

SYNONYM

\$

CAS NO. OSHA PEL (DI/M³) ACCIH TLV (me/m³)

n. .ε Ο<u>η</u>

Wassa Minoral Oils 85-100

N/E

5 (Miseral Oil)

5 (Mineral Oil) 10 STEL

Mainly a musture of aromatic, paraffinic, olclimic, naphthanic hydrocarbons. May contain chlorimated compounds as impunties.

Water/Solids

N/E

0-15

N/E

N/Ł

N/E

May comein metals as impurities.

N/E = Not Frablished

* See Section X - Other Regulatory Information

SECTION III -- PHYSICAL DATA

PHYSICAL STATE,

APPEARANCE AND ODOR:

Black liquid, mild petroleum odor,

'OILING POINT:

> 500° F

MELTING POINT:

Not Applicable

EVAPORATION RATE:

Not Established

PERCENT VOLATILE:

Majority

APOR DENSITY:

Not Established

YAPOR PRESSURE:

Not Established

S UBILITY IN WATER:

Not Established

.l:

Not Established

-PECIFIC GRAVITY:

Less Than 1.0

CHRONIC:

Prolonged and/or repeated contact may cause drying and cracking of the skin or dermatitis.

DRAFT

THER POTENTIAL HEALTH HAZARDS:

The impurities that may be present are not expected to add significantly to the effects of exposure.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Individuals with pre-existing central nervous system dysfunction may have increased susceptibility to the effects of exposure. Contact with skin may aggravate pre-existing dermatits.

CARCINGGENICITY: Used motor oils are listed by IARC as suspected carcinogens.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES:

For direct contact, flush eyes with water for 15 minutes lifting upper and lower lids occasionally. Consult physician if imitation or pain persists. If imitation or redness from exposure to vapors or

mists develop, move victim away from exposure into fresh air.

SKIN:

Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and

persists, consult a physician.

INGESTION:

If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT

induce vomiting.

INHALATION:

Remove w fresh air immediately. Use oxygen if there is difficulty breathing or antificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical

attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL

PROCEDURES:

Remove all ignition sources. Ventilate area and avoid breathing vapors. For large spills, isolate area and deay entry. If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closable container for disposal. Wear protective equipment

specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL

METIIODS:

Dispose in accordance with Federal, State, and local regulations. Contact Safety-Kleen regarding

recycling.

HANDLING PRECAUTIONS:

Avoid conjuct with eyes, skin or clothing. Use in well ventilated area and avoid breathing vapors

or mists. Keep away from heat, sparks and open flames.

SHIPPING AND STORING

PRECAUTIONS:

Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind

or expose containers to flame or other sources of Ignition. Keep container tightly closed when not

in use and during transport.

PERSONAL HYGIENE:

Use good personal hygiene. Wash thurwughly with soap and water after handling and before eating, drinking or using tobacco products. Lumider contaminated clothing and clean protective

equipment before reuse.

MATERIAL SAFETY DATA SHEET BASE OILS

SECTION I -- IDENTITY INFORMATION

BRESLUBE DIVISION OF SAFETY KLEEN CANADA REGIONAL ROAD #17 P. O. BOX 130 BRESLAU, ONTARIO, CANADA EMERGENCY PHONE NUMBERS: 519-648-2291 519-648-2204 (24 HOURS) 1-800-265-2444 (ONTARIO) 1-800-265-2792 (U.S.A.) PRODUCT IDENTIFIER: BresLube -B85HT - B500HT Base Oils Family/Chemical Name: Re-refined lubricating oil; Hydrocarbon SYNONYMS: HVI paraffinic petroleum oil PRODUCT USAGE: A base oil which does not contain additives. Used for certain lubrication activities and as a base oil which may be blended with additives. This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section abovē.

SECTION II -- HAZARDOUS INGREDIENTS

These products are not hazardous in their normal intended usage. However if these products are to be used in applications where oil mists are generated, please refer to the section of this sheet entitled Other Information.

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid
APPEARANCE AND ODOUR: Amber
Viscous liquid with a
characteristic petroleum odour.
Odour threshold: Not determined
BOILING POINT: Wide range.
Generally > 260°C (500°F)
FREEZING POINT: Not applicable

BRESLUBE BASE OILS

EVAPORATION RATE: Very slow at room temperature. Approx. 1000X slower than ethyl ether.

PERCENT VOLATILE: Negligible VAPOUR DENSITY: Not determined. Heavier than air.

VAPOUR PRESSURE: At 25°C, <1 x 10⁻³ mm Hg estimate from similar product solubility IN WATER: At 20°C, insoluble PH: Not determined. SPECIFIC GRAVITY: Approx. 0.85 - 0.88 @ 15.5°C (60°F) (H20 = 1) COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HARARD DATA

FLASH POINT: 171°C (340°F) minimum. Cleveland Open Cup. FIRE POINT: Not determined; Estimated to be 10 - 20 CO (18 -36 F^O) higher than flash point. CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames. FLAMMABLE LIMITS 'IN AIR - LOWER: Not determined. (14 typical for petroleum product mists) FLAMMABLE LIMITS IN AIR - UPPER: Not determined. (10% typical for petroleum product mists) EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread. FIRE FIGHTING PROCEDURES --SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray. UNUSUAL FIRE AND EXPLOSION HAZARDS: Decomposition and combustion products may be toxic. Heated tanks and drums may rupture, explode or be thrown into the air. HAZARDOUS COMBUSTION PRODUCTS: Thermal decomposition and burning may produce carbon monoxide, carbon dioxide,

MATERIAL SAFETY DATA SHEET BASE OILS

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID

PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists. EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious. EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to ...dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to fresh air. Administer artificial respiration if breathing is stopped. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

BRESLUBE BASE OILS

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable. PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended. EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles. RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit. OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities

SECTION VIII (c) -- SPECIAL PRECAUTIONS

of product.

HANDLING PRECAUTIONS: Do not get in eyes, on skin or clothing. Do not inhale mists or heated vapors. Do not taste or swallow. Use with adequate ventilation. Wait for hot oil to cool before handling. SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not reuse containers. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

MATERIAL SAFETY DATA SHEET DIESEL ENGINE OILS

SECTION I -- IDENTITY INFORMATION

BRESLUBE

DIVISION OF SAFETY-KLEEN CANADA, INC.

REGIONAL ROAD #17

P.O. BOX 130

BRESLAU, ONTARIO, CANADA

NOB 1MO

EMERGENCY PHONE NUMBERS:

519-648-2291

519-648-2204 (24 HOURS)

1-800-265-2444 (ONTARIO)

1-800-265-2792 (U.S.A.)

PRODUCT IDENTIFIER:

SAE 10W

SAE 20W20

SAE 30

SAE 40

Family/Chemical Name: Re-refined lubricating oil; Hydrocarbon SYNONYMS:

HD-2 10W

HD-2 20W20

HD-2 30

HD-2 40

PRODUCT USAGE: Engine oils used for the lubrication of diesel engines.

This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section above.

SECTION II -- HAZARDOUS INGREDIENTS

These products are not hazardous in their normal intended usage. However if these products are to be used in applications where oil mists are generated, please refer to the section of this sheet entitled Other Information.

BRESLUBE DIESEL ENGINE OIL HD-2

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid. APPEARANCE AND ODOUR: Amber viscous liquid with a characteristic petroleum odour. Odour threshold: Not determined BOILING POINT: Wide range. Generally > 260°C (500°F) FREEZING POINT: Not applicable. EVAPORATION RATE: Very slow at room temperature. Approx. 1000X slower than ethyl ether. PERCENT VOLATILE: Negligible. VAPOUR DENSITY: Not determined. Heavier than air. VAPOUR PRESSURE: At 25°C, <1 x 10⁻³mm Hg estimate from similar SOLUBILITY IN WATER: At 20°C. insoluble. PH: Not determined. SPECIFIC GRAVITY: Approx. 0.85 - 0.88 @ 15.5°C (60° F) ($H_20 = 1$) COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 171°C (340°F) minimum. Cleveland Open Cup. FIRE POINT: Not determined; Estimated to be 10 - 20 CO (18 -36 FO) higher than flash point. CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames. FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists). FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists). EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread. FIRE FIGHTING PROCEDURES ---SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water

SECTION VI -- HEALTH HAZARD DATA CONTINUED...

MUTAGENICITY: This product has been tested by the Modified Salmonella Mutagenicity Assay and is predicted to be non-mutagenic.

TOYLOGICALLY SYNERGISTIC

TOXICOLOGICALLY SYNERGISTIC PRODUCTS: Not determined.

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID

PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists. EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious. EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to-fresh air. Administer artificial respiration if breathing is stopped. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable. PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended. EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles. RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit. OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities of product.

3

MATERIAL SAFETY DATA SHEET DIESEL ENGINE OILS

SECTION I -- IDENTITY INFORMATION

BRESLUBE

DIVISION OF SAFETY-KLEEN CANADA,

REGIONAL ROAD # 17
P. O. BOX 130
BRESLAU, ONTARIO, CANADA
NOB 1MO
EMERGENCY PHONE NUMBERS:

519-648-2291

519-648-2204 (24 HOURS)

1-800-265-2444 (ONTARIO)

1-800-265-2792 (U.S.A.)

PRODUCT IDENTIFIER:

SAE 5W30 SAE 10W SAE 10W30 SAE 20W20 SAE 10W40 SAE 30 SAE 15W40 SAE 40 SAE 50

Family/Chemical Name: Re-refined lubricating oil; Hydrocarbon SYNONYMS:

SHD	5W30	SHD	10W
SHD	10W30	SHD	20W20
SHD	10W40	SHD	30
SHD	15W40	SHD	40
		SHD	50

PRODUCT USAGE: Engine oils used for the lubrication of diesel engines.

This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section above.

SECTION II -- HAZARDOUS INGREDIENTS

These products are not hazardous in their normal intended usage. However if these products are to be used in applications where oil mists are generated, please refer to the section of this sheet entitled Other Information.

BRESLUBE DIESEL ENGINE OIL SHD

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid. APPEARANCE AND ODOUR: Amber viscous liquid with a characteristic petroleum odour. Odour threshold: Not determined. BOILING POINT: Wide range. Generally > 260°C (500°F)
FREEZING POINT: Not applicable. EVAPORATION RATE: Very slow at room temperature. Approx. 1000X slower than ethyl ether. PERCENT VOLATILE: Negligible. VAPOUR DENSITY: Not determined. Heavier than air. VAPOUR PRESSURE: At 25°C, <1 x 10 mm Hg estimate from similar product. SOLUBILITY IN WATER: At 20°C, insoluble. PH: Not determined. SPECIFIC GRAVITY: Approx. 0.85 - $0.88 \text{ (60}^{\circ}\text{F)} \text{ (H}_2\text{0} = 1)$ COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 171°C (340°F) minimum. Cleveland Open Cup. FIRE POINT: Not determined; Estimated to be 10 - 20 Co (18 -36 FO) higher than flash point. CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames. FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists). FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists). EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread. FIRE FIGHTING PROCEDURES --SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water

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MATERIAL SAFETY DATA SHEET DIESEL ENGINE OILS

SECTION VI -- HEALTH HAZARD DATA CONTINUED...

MUTAGENICITY: This product has been tested by the Modified Salmonella Mutagenicity Assay and is predicted to be non-mutagenic.

TOXICOLOGICALLY SYNERGISTIC PRODUCTS: Not determined.

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID
PROCEDURES -- EYES: Flush eyes
with water for 15 minutes or
until irritation subsides. Get
medical attention if irritation
persists.

EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious. EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to fresh air. Administer artificial respiration if breathing is stopped. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

BRESLUBE DIESEL ENGINE OIL SHD

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable. PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended. EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles. RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit. OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities of product.

MATERIAL SAFETY DATA SHEET FUEL OILS

SECTION I -- IDENTITY INFORMATION

BRESLUBE
DIVISION OF SAFETY-KLEEN CANADA,
INC.
REGIONAL ROAD #17
P. O. BOX 130
BRESLAU, ONTARIO, CANADA
EMERGENCY PHONE NUMBERS:
519-648-2291
519-648-2291
519-648-2204 (24 HOURS)
1-800-265-2444 (ONTARIO)
1-800-265-2792 (U.S.A.)
PRODUCT IDENTIFIER:

BresLube # 2 Fuel Oil.

Family/Chemical Name:
Hydrocarbon.
SYNONYMS: Diesel Fuel: Fuel Oil.
PRODUCT USAGE: A #2 Fuel oil
equivalent used in large boilers
or furnaces.
This Material Safety Data Sheet
is prepared as a generic sheet
for the family of products
listed in the Identity section
above.

SECTION II -- HAZARDOUS INGREDIENTS

SPECIFIC CHEMICAL NAME: Fuel Oil #2

PERCENT: 100%

CAS REGISTRY: 68476-30-2 HAZARD: Toxic Material; Combustible Liquid.

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid.

APPEARANCE AND ODOUR: Amber
liquid with a characteristic
odour. Odour threshold: Not
determined.

BOILING POINT: Wide range.
FREEZING POINT: Not applicable.

BRESLUBE FUEL OILS

EVAPORATION RATE: Slow at room temperature. Approx. 1000X slower than ethyl ether. PERCENT VOLATILE: Negligible. VAPOUR DENSITY: Not determined. Heavier than air. VAPOUR PRESSURE: At 25°C, <1 x 10⁻³ mm Hg estimate from similar product. SOLUBILITY IN WATER: At 20°C, insoluble. PH: Not determined. SPECIFIC GRAVITY: Approx. 0.84 - 0.86 @ 15.5°C (60°F) (H₂0 = 1) COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 50°C (132°F) minimum. Cleveland Open Cup. FIRE POINT: Not determined; Estimated to be 10 - 20 C° (18 -36 F^O) higher than flash point. CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames. FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists). FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists). EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread. FIRE FIGHTING PROCEDURES --SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray. UNUSUAL FIRE AND EXPLOSION HAZARDS: Decomposition and combustion products may be toxic. Heated tanks and drums may rupture, explode or be thrown into the air.

MATERIAL SAFETY DATA SHEET FUEL OILS

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID

PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists. EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious. EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention.

EMERGENCY AND FIRST AID
PROCEDURES -- INHALATION: Remove
to fresh air. Administer
artificial respiration if
breathing is stopped. Get
medical attention.
EMERGENCY AND FIRST AID
PROCEDURES -- OTHER: Remove and
wash non-impervious contaminated
clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective

BRESLUBE FUEL OILS

equipment specified below.
Contain away from surface waters and sewers.
WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable. PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended. EYE PROTECTION: In cases where there is likelihood of eve contact, wear splashproof goggles. RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit. OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities of product.

SECTION VIII (c) -- SPECIAL PRECAUTIONS

HANDLING PRECAUTIONS: Do not use mouth to suction liquid due to aspiration hazard. Do not get in eyes, on skin or clothing. Do not inhale mists or heated vapors. Do not taste or swallow. Use with adequate ventilation.

BRESLUBE FUEL OIL #4

MATERIAL SAFETY DATA SHEET BRESLUBE FUEL OILS

SECTION I -- IDENTITY INFORMATION

PETROCON DIVISION OF SAFETY-KLEEN CANADA INC. UNION STREET MODENA, PENSYLVANIA EMERGENCY PHONE NUMBERS: 215-383-5262 519-648-2204 (24 HOURS) . 1-800-265-2444 (ONTARIO) 1-800-265-2792 (U.S.A.) PRODUCT IDENTIFIER: PETROCON # 4 Low Sulfur Fuel Oil Family/Chemical Name: Hydrocarbon. SYNONYMS: Fuel oil, Blended processed motor, hydraulic, chain oils with # 2 oil. PRODUCT USAGE: A #4 Fuel oil equivalent used in large boilers or furnaces. This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section

SECTION II -- HAZARDOUS INGREDIENTS

above.

SPECIFIC CHEMICAL NAME: Fuel Oil #4.
PERCENT: 100%
CAS REGISTRY: 68476-30-2.
HAZARD: Toxic Material;
Combustible Liquid.

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid.

APPEARANCE AND ODOUR: Black
petroleum with a characteristic
odour. Odour threshold: Not
determined.

BOILING POINT: Wide range,
>1490C.
(3000F).

FREEZING POINT: Not applicable. EVAPORATION RATE: Slow at room temperature. Approx. 1000X slower than ethyl ether. PERCENT VOLATILE: Negligible. VAPOUR DENSITY: Not determined. Heavier than air. VAPQUR PRESSURE: At 25°C, <1 x 10⁻³ mm Hg estimate from similar product. SOLUBILITY IN WATER: At 20°C. insoluble. PH: Not determined. SPECIFIC GRAVITY: Approx. 0.84 -0.86 @ 15.5°C (60°F) $(H_20 = 1)$ COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 99°C (210°F). minimum. Cleveland Open Cup. FIRE POINT: Not determined; Estimated to be $10 - 20 \, \text{C}^{\text{O}}$ (18 -36 F^O) higher than flash point. CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames. FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists). FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists). EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread. FIRE FIGHTING PROCEDURES --SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray. UNUSUAL FIRE AND EXPLOSION HAZARDS: Decomposition and combustion products may be toxic. Heated tanks and drums may rupture, explode or be thrown into the air.

MATERIAL SAFETY DATA SHEET BRESLUBE FUEL OILS

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID

PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists. EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious. EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to fresh air. Administer artificial respiration if breathing is stopped. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for

BRESLUBE FUEL OIL #4

disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable. PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended. EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof qoqqles. RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit. OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities of product.

SECTION VIII (c) -- SPECIAL PRECAUTIONS

HANDLING PRECAUTIONS: Do not use mouth to suction liquid due to aspiration hazard. Do not get in eyes, on skin or clothing. Do not inhale mists or heated vapors. Do not taste or swallow. Use with adequate ventilation.

BRESLUBE FUEL OIL #5

MATERIAL SAFETY DATA SHEET BRESLUBE FUEL OILS

SECTION I -- IDENTITY INFORMATION

PETROCON DIVISION OF SAFETY-KLEEN CANADA INC. UNION STREET MODENA, PENSYLVANIA EMERGENCY PHONE NUMBERS: 215-383-5262 519-648-2204 (24 HOURS) 1-800-265-2444 (ONTARIO) 1-800-265-2792 (U.S.A.) PRODUCT IDENTIFIER: PETROCON # 5 Low Sulfur Fuel Oil. Family/Chemical Name: Hydrocarbon. SYNONYMS: Fuel oil, blended processed motor, hydraulic, chain oils with # 2 oil. PRODUCT USAGE: A # 5 Fuel oil equivalent used in large boilers or furnaces. This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section

SECTION II -- HAZARDOUS INGREDIENTS

above.

SPECIFIC CHEMICAL NAME: Fuel Oil # 5.
PERCENT: 100%
CAS REGISTRY: 68476-30-2.
HAZARD: Toxic Material;
Combustible Liquid.

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid.

APPEARANCE AND ODOUR: Black
petroleum with a characteristic
odour. Odour threshold: Not
determined.

BOILING POINT: Wide range,
>149°C (300°F).
FREEZING POINT: Not applicable.

EVAPORATION RATE: Slow at room temperature. Approx. 1000X slower than ethyl ether. PERCENT VOLATILE: Negligible. VAPOUR DENSITY: Not determined. Heavier than air. VAPOUR PRESSURE: At 25°C, <1 x 10⁻³ mm Hg estimate from similar product. SOLUBILITY IN WATER: At 20°C, insoluble. PH: Not determined. SPECIFIC GRAVITY: Approx. 0.84 - 0.86 @ 15.5°C (60°F) (H20 = 1). COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 99°C (210°F). minimum. Cleveland Open Cup. FIRE POINT: Not determined; Estimated to be 10 - 20 CO (18 -36 FO) higher than flash point. CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames. FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists). FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists). EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread. FIRE FIGHTING PROCEDURES --SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray. UNUSUAL FIRE AND EXPLOSION HAZARDS: Decomposition and combustion products may be toxic. Heated tanks and drums may rupture, explode or be thrown into the air.

MATERIAL SAFETY DATA SHEET BRESLUBE FUEL OILS

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID

PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists. EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious. EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to fresh air. Administer artificial respiration if breathing is stopped. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovelinto closeable container for

BRESLUBE FUEL OIL #5

disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust

recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable. PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended. EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles. RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit. OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities of product.

SECTION VIII (c) -- SPECIAL PRECAUTIONS

HANDLING PRECAUTIONS: Do not use mouth to suction liquid due to aspiration hazard. Do not get in eyes, on skin or clothing. Do not inhale mists or heated vapors. Do not taste or swallow. Use with adequate ventilation.

MATERIAL SAFETY DATA SHEET HYDRAULIC OILS

SECTION I -- IDENTITY INFORMATION

BRESLUBE

DIVISION OF SAFETY-KLEEN CANADA INC.

REGIONAL ROAD #17

P. O. BOX 130

BRESLAU, ONTARIO, CANADA

NOB 1MO

EMERGENCY PHONE NUMBERS:

519-648-2291

519-648-2204 (24 HOURS)

1-800-265-2444 (ONTARIO)

1-800-265-2792 (U.S.A.)

PRODUCT IDENTIFIER:

AW 22H

AWD46H

AW 22HL

LT22

AW 32H

LT36

AW 46H

LT56

AW 68H

HYD30

AW 100H

AW 150H

Family/Chemical Name: Re-refined lubricating oil; Hydrocarbon.

SYNONYMS:

PRODUCT USAGE: Oils used for lubrication within hydraulic systems.

This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section above.

SECTION II -- HAZARDOUS INGREDIENTS

These products are not hazardous in their normal intended usage. However if these products are to be used in applications where oil mists are generated, please refer to the section of this sheet entitled Other Information.

SECTION III -- PHYSICAL DATA

BRESLUBE ANTIWEAR HYDRAULIC OIL

BOILING POINT: Wide range. Generally > 260° C (500° F) FREEZING POINT: Not applicable. EVAPORATION RATE: Very slow at room temperature. Approx. 1000X slower than ethyl ether. PERCENT VOLATILE: Negligible. VAPOUR DENSITY: Not determined. Heavier than air. VAPOUR PRESSURE: At 25°C, <1 x 10⁻³ mm Hg estimate from similar SOLUBILITY IN WATER: At 20°C. insoluble. PH: Not determined. SPECIFIC GRAVITY: Approx. 0.85 -0.88 @ 15.5° C (60° F) (H_2 0 = 1) COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 171°C (340°F) minimum. Cleveland Open Cup. FIRE POINT: Not determined; Estimated to be 10 - 20 CO (18 -36 F^O) higher than flash point. CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames. FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists). FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists). EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread. FIRE FIGHTING PROCEDURES ---SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Decomposition and combustion products may be toxic. Heated tanks and drums may rupture, explode or be thrown into the air.

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MATERIAL SAFETY DATA SHEET HYDRAULIC OILS

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID

PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists. EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious. EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to fresh air. Administer artificial respiration if breathing is stopped. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective equipment specified below.

BRESLUBE ANTIWEAR HYDRAULIC OIL

Contain away from surface waters and sewers.
WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable. PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended. EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles. RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit. OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities of product.

SECTION VIII (c) -- SPECIAL PRECAUTIONS

HANDLING PRECAUTIONS: Do not get in eyes, on skin or clothing. Do not inhale mists or heated vapors. Do not taste or swallow. Use with adequate ventilation. Wait for hot oil to cool before handling. SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not reuse. containers. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

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MATERIAL SAFETY DATA SHEET PASSENGER CAR ENGINE OILS

SECTION I -- IDENTITY INFORMATION

BRESLUBE

DIVISION OF SAFETY-KLEEN CANADA INC.

REGIONAL ROAD #17

P. O. BOX 130

BRESLAU, ONTARIO, CANADA

NOB 1MO

EMERGENCY PHONE NUMBERS:

519-648-2291

519-648-2204 (24 HOURS)

1-800-265-2444 (ONTARIO)

1-800-265-2792 (U.S.A.)

PRODUCT IDENTIFIER:

SAE	5W30	SAE	10W
SAE	10W30	SAE	20W20
SAE	10W40	SAE	30
SAE	20W40	SAE	40
SAE	20050	SAE	50

Family/Chemical Name: Re-refined lubricating oil; Hydrocarbon SYNONYMS:

PRODUCT USAGE: Oils used for the lubrication in passenger motors. This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section above.

SECTION II -- HAZARDOUS INGREDIENTS

These products are not hazardous in their normal intended usage. However if these products are to be used in applications where oil mists are generated, please refer to the section of this sheet entitled Other Information.

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid
APPEARANCE AND ODOUR: Amber
Viscous liquid with a
Characteristic petroleum odour.
Odour threshold: Not determined
BOILING POINT: Wide range.
Generally > 260°C (500°F)

BRESLUBE ENGINE OIL

FREEZING POINT: Not applicable. EVAPORATION RATE: Very slow at room temperature. Approx. 1000X slower than ethyl ether. PERCENT VOLATILE: Negligible. VAPOUR DENSITY: Not determined. Heavier than air. VAPOUR PRESSURE: At 25°C, <1 x 10⁻³ mm Hg estimate from similar product. SOLUBILITY IN WATER: At 20°C, insoluble. PH: Not determined. SPECIFIC GRAVITY: Approx. 0.85 -0.88 @ 15.5° C $(60^{\circ}F)^{\circ}$ (H₂0 = 1) COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 171°C (340°F) minimum. Cleveland Open Cup. FIRE POINT: Not determined; Estimated to be 10 - 20 CO (18 -36 FO) higher than flash point. CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames. FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists). FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists). EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread. FIRE FIGHTING PROCEDURES ---SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray. UNUSUAL FIRE AND EXPLOSION HAZARDS: Decomposition and combustion products may be toxic. Heated tanks and drums may rupture, explode or be thrown into the air.

MATERIAL SAFETY DATA SHEET PASSENGER CAR ENGINE OILS

SECTION VII -- FIRST AID MEASURES

PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists.

EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious. EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to fresh air. Administer artificial respiration if breathing is stopped. Get medical attention. EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective equipment specified below. Contain away from surface waters: and sewers.

BRESLUBE ENGINE OIL

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust

recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable. PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended. EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles. RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit. OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities

SECTION VIII (c) -- SPECIAL PRECAUTIONS

of product.

HANDLING PRECAUTIONS: Do not get in eyes, on skin or clothing. Do not inhale mists or heated vapors. Do not taste or swallow. Use with adequate ventilation. Wait for hot oil to cool before handling. SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not reuse containers. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

PART VI

DATA MANAGEMENT PLAN

RCRA FACILITY INVESTIGATION
PHASE I RELEASE ASSESSMENT WORKPLAN
DOLTON RECYCLE CENTER



TriHydro Corporation

920 Sheridan Street Laramie, Wyoming 82070

(307) 745-7474 FAX: (307) 745-7729

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PART VI

DATA MANAGEMENT PLAN

The Data Management Plan presents the procedures to be used to document and track investigation data and results. The objective of this plan is to organize and present the Phase I data and results in an understandable format that will permit decision-makers to 1) determine the need for and scope of a Phase II investigation, and 2) evaluate the need for and scope of corrective action to protect human health and the environment.

Data Record

The information sources for the Phase I Release Assessment will be field observations during soil and ground-water sampling and laboratory analyses of soil and ground-water samples collected at background and solid waste management unit locations. Procedures to organize and present these raw data are described below.

Field Data

The sampling team will record field observations during sampling in a field log book. The types of field observations to be recorded are listed in a section of Part IV entitled "Field Documentation." A copy of the field notes will be included as an appendix in the RFI Phase I Report.

Field observations are critical to the verification and interpretation of the laboratory data. During the quality assurance process (Part VII), the quality assurance officer will evaluate the validity of the laboratory data in part on the basis of apparent soil and ground-water quality observed by the project site manager during sampling. The quality assurance officer may request that the laboratory reanalyze certain samples for certain constituents with data that appear inconsistent with field observations.

The only quantitative data collected during soil sampling will be measurements of combustible gas and total organic vapors (TOV) as part of health and safety procedures (Part V) and field screening procedures (Part IV). The remainder of the field observations will be qualitative or descriptive. Graphical and/or tabular displays of TOV data are planned. A summary of qualitative and descriptive field observations will

be presented in the text of the report, and consistencies and contrasts between field observations and laboratory data will be noted.

Laboratory Data

A laboratory data report will be prepared by S-K Tech Center. This laboratory report will contain all laboratory data on the soil and ground-water samples as well as the quality assurance data. The laboratory data report will also include copies of the completed chain-of-custody/sample-analysis-request forms. A copy of the laboratory data report will be included as an appendix in the RFI Phase I Report. The laboratory data record will contain:

- A unique sample code which can be related to a sampling location shown on a map in the RFI Phase I Report
- Sample type (i.e., soil or water sample)
- Laboratory analysis identification number
- Constituent measured
- Analytical method
- Result of the analysis (e.g., concentration)
- The method detection limit

Data Reduction

Data reduction covers the handling of blind duplicates and internal laboratory replicates, outliers, data below method detection limits and quality assurance data. Blind duplicate data will be listed in the data summary tables, and not averaged. Internal laboratory replicate data will be averaged during data reduction, and the averages will be presented in the data summary tables of the RFI Phase I Report with a notation that the values represent internal laboratory replicate averages. Individual internal replicate data will be shown in the laboratory data report, and discussed under a quality assurance section in the RFI Phase I Report (Part VII).

Any program of environmental measurement can produce outlier numbers that lie outside the "expected" range of values. Outlier values may be the result of:

- 1. A catastrophic unnatural (but real) occurrence, such as a spill;
- Inconsistent sampling or analytical chemistry methodology;
- Errors in the transcription of data values or decimal points; and
- 4. True but extreme concentration measurements.

Documentation and validation of the cause of outliers will accompany any attempt to correct or delete data values, because true but extreme values will not be altered. Outlier values will not be omitted from the raw data reported to the regulatory agency, but will be identified as outliers within the data summary tables. Reasons for the outlying behavior will be provided in the data summary tables or in the text of the RFI Phase I report.

Data below detection limits will be expressed as "ND (method detection limit)," where "ND" means not detected and "method detection limit" is the quantitative value determined by the laboratory.

Quality assurance data will be discussed in detail in the quality assurance chapter of the Phase I Report. Quality assurance information will be included in other chapters to the extent that it affects the interpretation of sample data. In particular, constituents detected in the quality assurance samples and the samples collected from background sites may be included in the data summary tables, so that the reader can factor out background and sampling— or laboratory—introduced contaminants.

Tabular Displays

One objective of the Phase I Release Assessment is to identify if releases of hazardous waste or hazardous constituents from solid waste management units (SWMUs) has occurred, is occurring, or could occur. To accommodate that objective, the sample data from background and SWMU sites will be presented in data summary tables within the text. The tables will identify the sampling location and the concentration in milligrams per kilogram (parts per million) for each constituent detected in one or more samples. Background data will be listed under a tabular heading "Background Sites," and soil data from each SWMU will be listed under the appropriate tabular heading for that SWMU, such as "West Tank Farm." Ground-water data will not segregated by SWMU. If relevant,

data will be further sorted by stratification factor (location, soil layer, topography) and aquifer.

Constituents not detected in any sample will be grouped under a heading "All Other Constituents (number of other constituents)," and the data entry will be ND. Names of these other constituents and the method detection limits can be found in the appendix containing the laboratory data report. This grouping of "non-detect" data permit the report reader to focus more easily on the "detect" data of potential environmental significance.

The depth at which all soil samples were collected will be in a column on the soil data summary tables giving the depth in feet below ground surface (ft-bgs) at which the sample was collected. The aquifer from which ground-water samples were collected will be entered into the ground-water data summary tables. Constituents which are not hazardous constituents (40 CFR Part 261, Appendix VIII) will be identified in the data summary tables. Other information critical to the interpretation of the data will also be included as table footnotes for easy reference.

The second objective of Phase I is to evaluate whether any releases of hazardous constituents represent a hazard to human health and the environment. The U.S. Environmental Protection Agency (EPA) has proposed limits which represent a hazard to human health and the environment (55 FR 30798-30884, July 27, 1990). These limits or successors will be listed in the data summary tables for the hazardous constituents detected in one or more samples. Concentrations which exceed the limits will be highlighted in boldface type in the data summary tables. A footnote to the tables will explain the meaning of the boldface type.

Graphical Displays

Graphical displays will be used to highlight the most critical information collected during the Phase I investigation. The following figures will be included in the RFI Phase I report, if appropriate:

- A facility location map (Figure I-2-1 of Part I or similar)
- Sampling site location maps
- Facility plot plans with additional information that shows the SWMU or background sampling location, constituent, and concentrations for all con-

stituents which exceed background (unless too numerous) and/or which exceed the EPA limits indicating possible hazard to human health and the environment.

- Features which affect intramedia transport and potential receptors
- Areas where more data are required.

Air Quality Evaluation

Screening level mass loading calculations will be performed to determine whether air emissions from solid waste management units (SWMUs) will pose a threat to human health or the environment. Screening calculations will be conservatively based on methods presented by the U.S. Environmental Protection Agency for the calculations of volatilization of chemicals released directly onto surface soils (U.S. Environmental Protection Agency, 1988). Safety-Kleen Corp. will use the soil and ground-water quality data collected from the shallowest depth during the Phase I Release Assessment to perform these calculations. The calculated loading rates from SWMUs will be compared to the regulatory limits on air emissions from all process vents at the facility to determine if the SWMU loadings pose a threat to human health or the environment.

Reporting

Three types of reports will be prepared during Phase I. The RFI Phase I Release Assessment Workplan will clearly define the objectives of the investigation and the procedures to achieve those objectives. A final report will be submitted to the decision makers (Safety-Kleen Corp. and the Illinois Environmental Protection Agency), and will include the information necessary to determine the need for and scope of a Phase II investigation and the need for and scope of corrective action. Quarterly progress reports will keep the decision makers informed of the progress of the Phase I investigation.

Workplan

This RFI Phase I Workplan describes the objectives, personnel, time schedule, and procedures to be implemented

during the Phase I investigation. The Phase I release assessment investigation will not commence until concurrence is achieved on this Workplan.

Quarterly Progress Reports

Quarterly progress reports will be submitted to summarize information regarding percentage of the project completed, activities completed during the reporting period, changes in the implementation of the Workplan, problems encountered during the reporting period, proposed corrections to these problems, projected work for the next reporting period, and any other pertinent information.

<u>Final Report</u>

An RFI Phase I Release Assessment Report will be submitted to the agencies at the completion of the project. The report will include:

- Sampling locations and sampling procedures;
- Appendices containing field observations made during sampling and the laboratory data report;
- Tabular summaries of the Phase I laboratory data with highlights of data exceeding background and/or EPA limits indicating potential impacts to human health and the environment; and
- Graphical displays of sampling locations with a listing of concentrations exceeding background (unless too numerous) and exceeding EPA limits indicating potential impacts to human health and the environment.

The report will be revised and resubmitted if errors are found in the report which significantly affect the decision-making process.

If a significant release of hazardous constituents from a SWMU or AOC is identified during Phase I, Safety-Kleen Corp. will prepare an RFI Phase II Workplan to conduct additional investigations of impacts from the facility SWMUs on ground water, surface water, soils, and air. The content of the Workplan will be directed by the results collected during Phase I.

References

U.S. Environmental Protection Agency, 1988. Superfund Exposure Assessment Manual, Office of Remedial Response, Washington, D.C.

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PART VII

QUALITY ASSURANCE PROJECT PLAN

RCRA FACILITY INVESTIGATION
PHASE I RELEASE ASSESSMENT WORKPLAN
DOLTON RECYCLE CENTER
DOLTON, ILLINOIS
ILD980613913

_ Illinois Environmental Protection Agency Project Coordinator
_ Safety-Kleen Corp. Project Manager
 TriHydro Corporation Project Manager and/or Quality Assurance Officer
 S-K Environmental Laboratory Ouality Assurance Officer

Note: To be reviewed and signed prior to sampling event.

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SECTION VII-3

PROJECT DESCRIPTION

This Quality Assurance Project Plan (QAPjP) contains the procedures that will be used by Safety-Kleen Corp. (S-K) to ensure that data collected during the RCRA Facility Investigation (RFI) Phase I Release Assessment are complete, representative, comparable, accurate, and precise. The QAPjP presents the management organization, project and quality assurance objectives, and quality assurance and quality control (QA/QC) activities. It also describes the specific protocols which will be followed for sampling, sample handling and storage, chain of custody, and laboratory analysis to promote quality assurance and quality control.

The analytical laboratory (S-K Environmental Laboratory) plays a particularly important role in QA/QC. For that reason, a special section on laboratory QA/QC protocol is included as Appendix VII-A. Sections of the laboratory QA/QC are referenced where appropriate in the text of this QAPjP.

RFI Objectives

Safety-Kleen Corp. (S-K) owns and operates a recycling facility (SIC 2851) in Dolton, Illinois. S-K has owned and operated the facility since March 1987. The Dolton Recycle Center occupies a 30-acre site in an industrialized area about 20 miles south of downtown Chicago, Illinois (Figure VII-3-1). The address of the facility is:

Safety-Kleen Corp. 633 East 138th Street Dolton, IL 60419

The Dolton Recycle Center is a reclamation and recycling facility that accepts organic chemicals and solvent wastes from S-K service centers and other S-K recycle centers, and from industrial and commercial facilities. Spent materials brought to the facility are regenerated into product or blended for use as a fuel in cement kilns. Principal wastes managed at the facility are paint waste, lacquer thinner, mineral spirits, and waste oil.

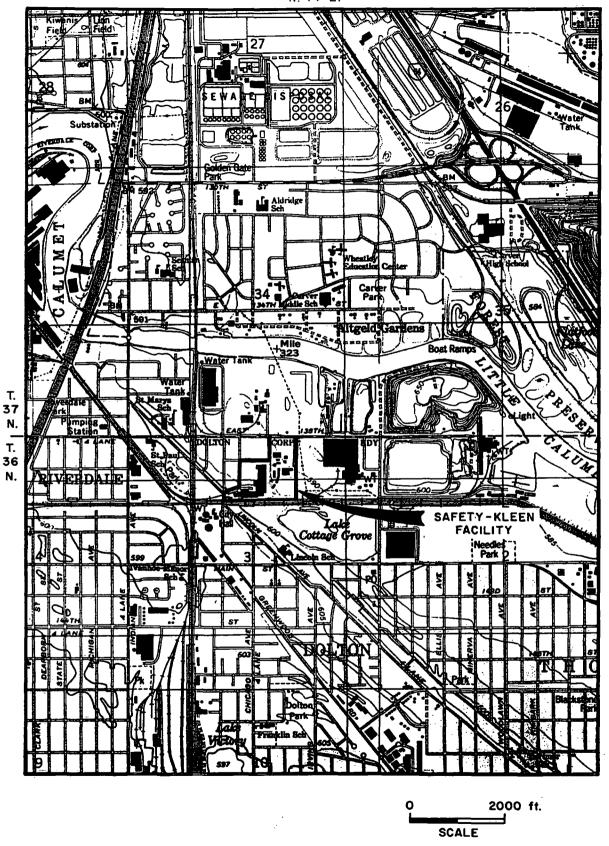


FIGURE VII-3-1 :VICINITY MAP, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (ILD980613913)

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The Dolton Recycle Center is permitted to store and treat RCRA hazardous wastes (ILD980613913). As a condition of the RCRA permit, the Illinois Environmental Protection Agency (IEPA) requires S-K to conduct a RCRA Facility Investigation (RFI). The purpose of the RFI is to determine the nature and extent of releases of hazardous wastes and hazardous constituents from certain solid waste management units (SWMUs) and areas of concern (AOC) at the facility.

In order to achieve the RFI objective, Illinois Environmental Protection Agency (IEPA) designed a three-phase process and incorporated it into the Part B Permit:

- Phase I Release Assessment Phase I is designed to provide information on the characteristics and integrity of each SWMU and to determine if a SWMU has released, is currently releasing, or has the potential to release hazardous waste and/or hazardous constituents to the soil or air.
- <u>Phase II Extent of Release Assessment</u> Phase II is designed to define the extent of releases (if any) to soil from these subject SWMUs.
- <u>Phase III Ground-Water Release Assessment</u> Phase III is designed to define the extent of releases to the ground water (if any) from SWMUs identified in Phase I or II to have potentially released hazardous waste or hazardous constituents to the ground water.

Regional Setting

The Dolton Recycle Center is located in the Village of Dolton approximately 20 miles south of downtown Chicago. The site occupies 30 acres in an area zoned M-5 (Industrial), which is the heaviest classification of industrial zoning in Cook County. The site and surrounding area have historically been devoted to light to heavy industrial users.

The site slopes very gently from south to north, and has about 5 feet of relief. The facility is not located in areas prone to flooding during a 100-year flood, based on information from the Illinois Department of Transportation, Division of Water Resources.

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The surface water features are the Little Calumet River, associated man-made marinas, and Lake Cottage Grove. The river flows east into Lake Michigan. The water level in the river is approximately 10 feet below the land surface elevation at the facility. The water level in Lake Cottage Grove is approximately 5 feet below the land surface at the facility.

Stormwater at the facility is routed by onsite sewers to the municipal sanitary sewer system. Therefore, no surface water from the site is discharged to either the Little Calumet River or Lake Cottage Grove.

Property use immediately surrounding the Center are open land to the north and east, a railroad corridor to the south, and a residential area to the west. The Stauffer Chemical/Rhone-Poulenc Basic Chemical Plant is located northwest of the Dolton Recycle Center. Fertilizer is produced at the plant. The plant has underground storage tanks, and is a large quantity generator of RCRA hazardous ignitable (D001), corrosive (D002), and reactive (D003) wastes.

Site Subsurface Conditions

Considerable information regarding subsurface conditions has been collected during previous investigations at the Dolton Recycle Center. Subsurface data have been collected at 63 locations on the facility during previous investigations. These previous investigations include:

- A 1979 geotechnical investigation to support plant expansion.
- A 1981 geotechnical investigation to support plant expansion.
- A 1983 environmental investigation in the vicinity of former underground storage tanks (USTs).
- A 1988 due diligence environmental investigation associated with property ownership transfer.
- A 1990 due diligence environmental investigation associated with property ownership transfer.
- A 1990-1991 environmental investigation to document clean closure of two fuel oil UST areas.

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These data collected during the six previous investigations have led to the identification of three impacted areas at the facility as well as site-specific conditions which limit the extent of impacts. This information has satisfied the objectives of Phase I of the RCRA Facility Investigation (RFI) to a large extent.

Soils Conditions

The sediment in the area consists of low permeability lake silts and clays, with a few interbedded sand lenses. Under the low permeability silts and clays is the Silurian-age Niagaran Dolomite Series. The formation is underlain progressively by the Maquoqueta Shale and the Galena-Platteville Series (mostly carbonates).

The lithology is consistent across the site. At the surface is a layer of topsoil (silty clay loam) or fill which is 1 to 4 feet thick. The fill consists of clay, silt, sand, gravel and rubble.

Under the topsoil or fill are silts and fine sands of the Carmi Member of the Equality Formation. This member consists of local discontinuous lenses of clay and medium to coarsegrained sand interbedded in the silt and fine sand matrix. The thickness of the silts and fine sands varies from up to 15 feet in the southeastern corner of the site to absent in the northeastern part of the site.

Under the silts and fine sands is the Wadsworth Member of the Wedron Formation, which is the dominant soil unit underlying the entire site. These deposits are low permeability, gray to brown silty clays and clayey silts. The clays are 35 to 40 feet thick across the entire site, and extend to bedrock. The composition of the clays changes from stiff at shallow depths to very stiff and hard near bedrock.

Bedrock was encountered at approximately 45 feet below ground surface. The uppermost bedrock is a hard, gray dolomite which is moderately fractured in the upper several feet, but less fractured with depth. No open voids were encountered in the bedrock during drilling.

Soil quality data indicate three areas of current or former soil impacts:

 <u>East Field</u>. Xylenes, toluene, and ethylbenzenes were measured at concentrations greater than 10 ppm.

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These constituents are principal components of mineral spirits. Only two chlorinated compounds were detected (1,1,2-trichloroethane at 0.4 ppm and methylene chloride at 0.25 ppm) at concentrations near the detection limit. Eight inorganic constituents were analyzed, and concentrations were at expected background levels.

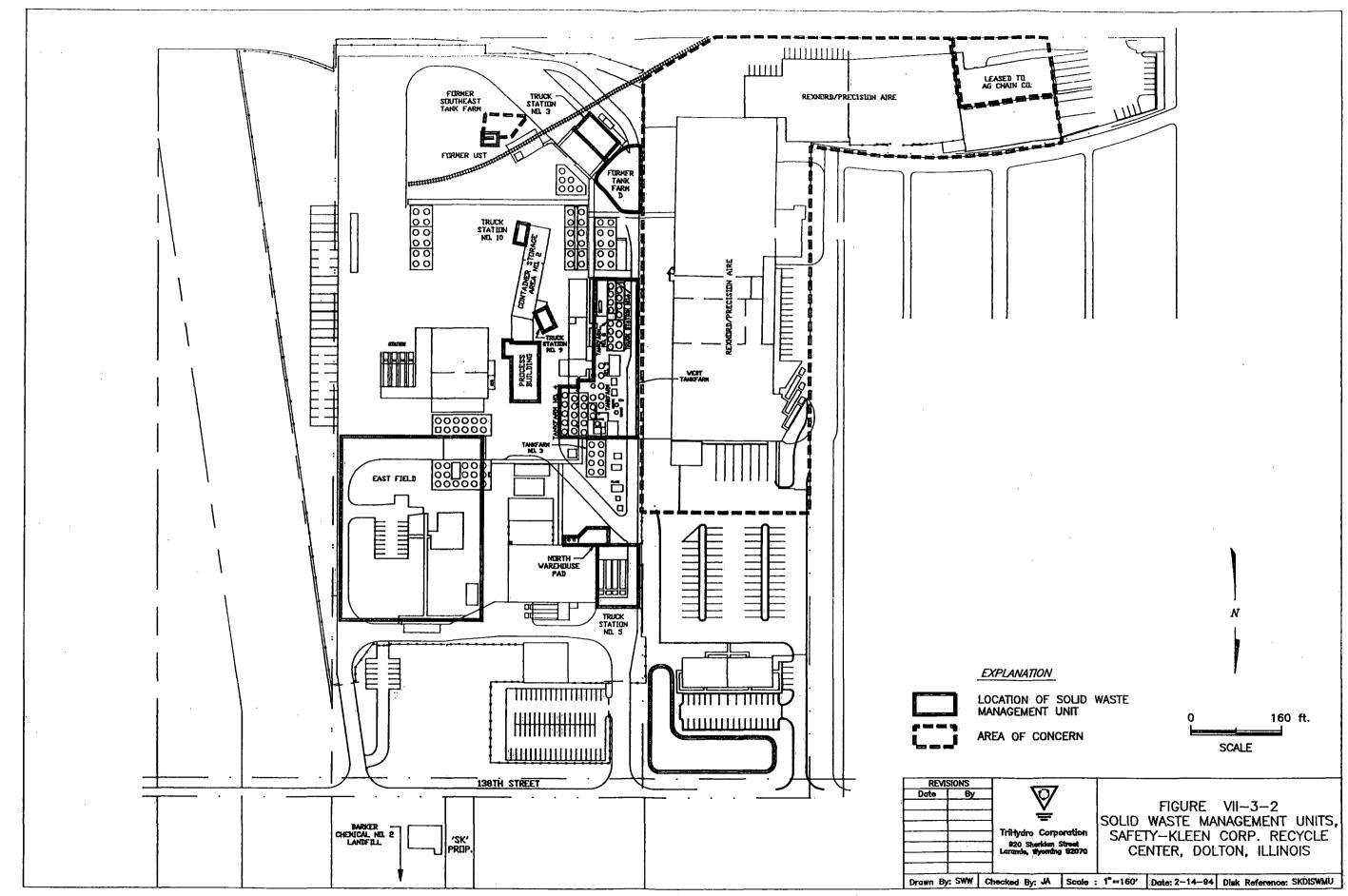
- West Tank Farm. Just as at the East Field, xylenes, toluene, and ethylbenzene were measured at concentrations greater than 10 ppm in samples collected to 5 feet below ground surface. No other VOCs (including no chlorinated VOCs) were detected at the West Tank Farm. VOC concentrations attenuated to below detection limits at 10 feet. Concentrations of inorganic constituents were at expected background levels.
- Former Tank Farm D. Just as at the other two SWMUs, xylenes, toluene, and ethylbenzene were measured at concentrations greater than 10 ppm. In addition, acetone and methyl isobutyl ketone (4-methyl 1,2-pentanone), which are principal components of lacquer thinner, were measured at concentrations greater than 10 ppm. Methylene chloride (0.1 ppm) was the only chlorinated VOC detected. Concentrations of inorganic constituents were at expected background levels.

The locations of the three solid waste management units (SWMUs) mentioned above are shown on Figure VII-3-2.

Ground-Water Conditions

The regional hydrogeology includes two shallow, water-bearing zones: a near-surface water-bearing zone perched on low permeability clays and silts and the Niagaran Dolomite aquifer. The shallow perched water-bearing zone was encountered at depths of 1 to 5 feet below ground surface. The shallow zone is present where permeable materials (fill and fine sand) are present. The shallow zone reaches its maximum thickness in the southeastern part at 15 feet. The shallow zone has been absent in the northeast corner.

A clay aquitard at least 30 feet thick underlies the entire facility. Based on a low permeability (2.7 to 5.5x10⁻⁸ cm/sec) and thicknesses greater than 30 feet across the entire site, the clay layer serves as a effective aquitard to prevent downward



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migration of constituents in the perched zone to the dolomite aquifer.

Underlying the clay aquitard is the dolomite aquifer at 45 feet below ground surface. Water was encountered near the bedrock surface in the three shallow bedrock monitoring wells installed at the site. Water supply wells at and near the facility are completed considerably deeper in bedrock; total depths of the water supply wells are a minimum of 210 feet below ground surface.

Ground water in the perched zone tends to flow from the southwestern corner toward the east and west property boundaries. The perched water-bearing zone was absent in the northeastern part of the facility in 1988 and 1993. The gradient is flat through much of the facility, and thus flow rates will be low in those areas.

Ground-water flow in the dolomite aquifer at the site is toward the southwest, based on 1988 data. Regionally, ground water in the dolomite aquifer is reported to flow eastward toward Lake Michigan. The difference between local and regional flow directions in the bedrock aquifer may be due to local pumping of water supply wells.

Ground-water quality was monitored in October-November 1983 and in October 1988. Ground-water quality impacts were identified in the East Field, at the West Tank Farm and east of Former Tank Farm D. Volatile organic constituents (VOCs) and metals were not detected at the other ground-water monitoring locations. The following VOCs exceeded Illinois Class II standards:

- Benzene, toluene, and trichloroethene in the West Tank Farm.
- 1,1,1-Trichloroethane near Former Tank Farm D.
- Tetrachloroethene in the East Field.

Metals concentrations were consistently at or below detection limits in the East Field and West Tank Farm.

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Solid Waste Management Units

The locations of solid waste management units (SWMUs) and areas of concern (AOCs) covered by the RFI are shown on Figure VII-3-2. Several of the SWMUs have been combined into Corrective Action Management Units (CAMUs) because of their proximity and similarity of wastes managed. SWMUs, CAMUs, and AOCs addressed in this Workplan are:

- Barker Chemical No. 2
- East Field
- Truck Station No. 3
- Truck Station No. 5
- North Warehouse Pad (Former Truck Station No. 6)
- Truck Station No. 9
- Truck Station No. 10
- Process Area in the South Warehouse (including Drum Emptying Unit Vat 1, Automated Drum Handling Unit Vat 2, Ballmill and Ballmill Sump)
- West Tank Farm [including Driveway to the Facility, Tank Farm No. 4, Tank Farm No. 5 (in-process storage tanks, Solvent Dryers #1 through #4, Pot Stills #1 and #2, Distillation Column, Thin Film Evaporator and Vapor Recovery Systems), Tank Farm No. 6, and Truck Station No. 4]
- Former Tank Farm D
- Former Southeast Tank Farm
- Rexnord/Precision Aire
- TriStamp/Agri-Chain

After discussions between S-K and IEPA, the other SWMUs listed in the Part B Permit (Container Storage Areas 1 and 2) were considered to be covered by other sections of the permit, and thus are not included in this Workplan (Illinois Environmental Protection Agency, 1994).

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Phase I Technical Approach

The Phase I technical approach has been designed to achieve the Phase I objective and to be consistent with the IEPA guidance in Attachment F of the Part B Permit for the Dolton Recycle Center. The technical approach accommodates the physical and chemical conditions present at the facility, which are detailed in Parts I and II of this Workplan.

Phase I Scope

In order to achieve the Phase I objectives, the specific goals of the SAP are to:

- Collect soil samples from those accessible locations and depths which are most likely to permit identification and proper characterization of a SWMU-related release of hazardous wastes or hazardous constituents, if a release has occurred.
- Analyze the soil samples for the SWMU-related hazardous constituents which permit the identification, characterization, and hazard evaluation of a release.
- Implement sampling and analysis procedures which promote the quality assurance goals of completeness, representativeness, comparability, accuracy, and precision.

The soils data will also be used to determine the potential for a release to air, as described in the Data Management Plan (Part VI of the Workplan).

Although not required for Phase I by the Part B Permit, Safety-Kleen Corp. (S-K) intends to conduct voluntary ground-water assessment during Phase I to identify and characterize ground-water quality impacts and further evaluate ground-water flow directions in the shallow perched zone. This information will be used to design appropriate activities during subsequent phases of the RCRA Facility Investigation (RFI).

Sampling Locations

Sampling locations have been selected to provide an evaluation of worst-case conditions caused by a release or potential release of hazardous wastes or hazardous constituents.

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Sampling will take place in areas of known releases, in areas where previous field screening data indicate releases have occurred, and in areas where experience from similar sites indicates releases are most likely to occur.

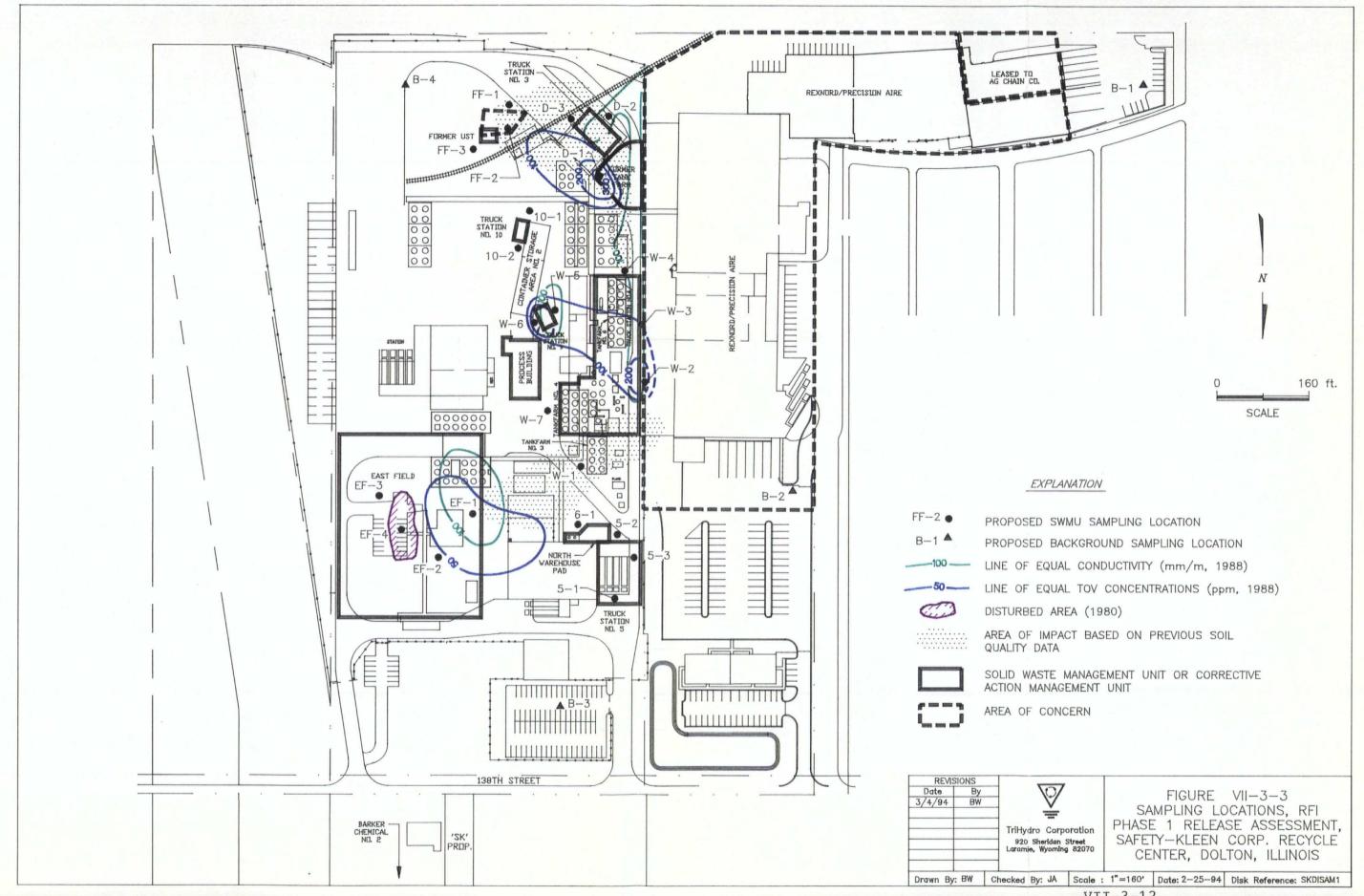
The background sampling locations are shown on Figure VII-3-3. The four background locations have been selected to satisfy the following criteria:

- 1. Located on Dolton facility property to minimize uncertainties about prior uses in the background areas.
- 2. Located at least 50 feet from any SWMUs listed in the Part B Permit as modified by IEPA and S-K.
- 3. Located at least 50 feet from any current or past industrial activity, based on review of aerial photos.
- 4. Spatial distribution across facility.
- 5. Same soil textures as encountered in SWMU soil samples (because natural inorganic constituent concentrations are a function in part of soil texture).

Background locations will be sampled first to minimize the potential for cross-contamination. If the onsite geologist determines that background soil samples are of a different soil texture than SWMU soil samples, he/she will collect samples from other background locations in order to satisfy the five background selection criteria listed above.

Twenty-three locations south of 138th Street will be sampled to identify and characterize releases to soils and shallow perched ground water. Criteria used to select sampling locations are:

- Within or adjacent to SWMUs. For areas with secondary containment (truck stations and West Tank Farm), sampling is planned next to the containment, because of access problems at several locations and concerns about damaging containment integrity at all locations.
- 2. In areas of known impact, based on previous soil data and ground-water data.



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- 3. In areas of suspected impact, based on information presented in Part II.
- 4. Areas where releases are more likely, which include valve locations where wastes are transferred between tank and tanker.

The 23 SWMU sampling locations south of 138th Street are shown on Figure VII-3-3 along with much of the rationale used for selecting the locations.

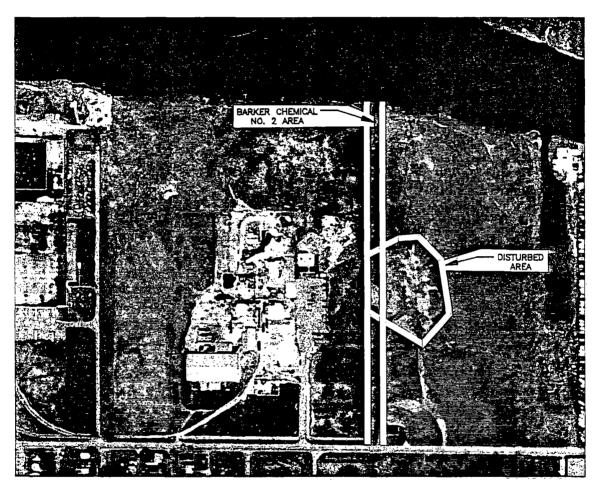
Three locations will be investigated in the vicinity of the disturbed area on S-K property (Barker Chemical No. 2 Area) north of 138th Street to determine whether a SWMU is or was present on S-K property. Sampling locations are shown on Figure VII-3-4. Two locations will be within the possible area of disturbance on an April 1980 aerial photo and along the eastern boundary of S-K property. The third location will be outside the apparent area of disturbance on an April 1980 aerial photo. The purpose for sampling this location will be to define native soil conditions in order to determine whether the other two locations are sited in backfill (possibly indicative of a SWMU) or native soil conditions. If a SWMU is present on S-K property (Barker Chemical No. 2 Area), soil samples will be collected and chemically analyzed from the disturbed area.

Soil Sampling Depths

At the Barker Chemical No. 2 Area, soil samples will be collected at 5-foot intervals from ground surface to 20 feet below ground surface. The onsite geologist will evaluate soil texture and field-screen the samples according to the procedures in Chapter IV-2. Based on this information, the geologist will determine if there is evidence that the SWMU is on S-K property, and subject to the soil sampling procedures described below.

After the determination whether a SWMU is present on S-K property in the Barker Chemical No. 2 Area, soil sampling will occur to identify and characterize releases from Dolton facility SWMUs. In addition, soil sampling and analysis will be conducted to define the vertical extent of impacts.

Soil samples for chemical analysis will be collected at about 2 feet and 20 feet below ground surface. Data from the shallow depth will be used to identify soil impacts, and data from the greater depth will be used to define extent. The deep sample at each location will be field screened, and a deeper



1980

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sample will be collected if necessary to define the vertical extent of impacts.

During the sampling program, the onsite geologist will evaluate the range of soil textures from the background locations to ensure that they match the range of soil textures encountered in soil samples underlying the SWMUs. If they do not match, additional background intervals and/or locations may be sampled to ensure a match.

Ground-Water Sampling Depths

A ground-water level will be measured and a water sample collected at all background and SWMU locations south of 138th Street where ground water is present in the perched zone (historically 1 to 5 feet below ground surface). Ground-water samples will be collected from the perched zone at a depth of approximately 5 to 10 feet below ground surface. At the Barker Chemical No. 2 Area north of 138th, ground-water levels will be measured and water samples collected only if perched ground water is present and if the SWMU is determined to be on S-K property. Fluid level and ground-water collection procedures are described in Section VII-6.

Laboratory Analysis

Samples will be submitted to S-K Environmental Laboratory for chemical analysis. The laboratory is located in Elk Grove Village, Illinois. The samples will be analyzed for the 107 constituents described in Table VII-3-1.

Intended Data Usage

The information sources for the Phase I Release Assessment will be field observations during soil and ground-water sampling, laboratory analyses of eight background and up to 50 SWMU soil samples, and laboratory analyses of four background and up to 25 ground-water samples.

The sampling team will record field observations during sampling in a field log book. Field observations are critical to the verification and interpretation of the laboratory data. During the quality assurance process, the quality assurance officer will evaluate the validity of the laboratory data in part on the basis of apparent soil and water quality observed during sampling. The quality assurance officer may request that

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Table VII-3-1. Constituent List, RFI Phase I Release Assessment, Dolton Recycle Center.

Constituent	Method (from SW-846)	Method Detection Limit (mg/kg)		
Inorganics	•			
Arsenic	7060	1.25		
Barium	6010	2.0		
Cadmium	6010	2.0		
Chromium	6010	4.0		
Lead	6010	11.0		
Mercury	7471	0.04		
Selenium	7740	0.9		
Silver	6010	3.0		
Organics*				
Volatile Organic Compounds (37)	8240	0.005-0.100		
Semi-Volatile Organic Compounds (62)	8270	0.33-3.3		

^{*} A complete list of organic compounds and method detection limits for individual compounds are presented in Appendix IV-B.

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the laboratory re-analyze certain samples for certain constituents with data that appear inconsistent with field observations.

A laboratory data report will be prepared by S-K Environmental Laboratory. This laboratory report will contain all laboratory data on the soil samples as well as the quality assurance data. The laboratory data report will also include copies of the completed chain-of-custody/sample-analysis-request forms.

One objective of the Phase I investigation is to identify releases of hazardous constituents from solid waste management units (SWMUs). To accommodate that objective, the laboratory data from background and SWMU sites will be presented in data summary tables within the text. The tables will identify the sampling location and the concentration in milligrams per kilogram (parts per million) for soils and milligrams per liter (mg/L) for ground water for each constituent detected in one or more samples. Background data will be listed under a tabular heading "Background Sites," and soil data from each SWMU will be listed under the appropriate tabular heading for that SWMU, such as "Truck Station No. 5." Ground-water data will not be sorted by SWMU. If relevant, data will be further sorted by stratification factor (soil layer, topography, aquifer).

The second objective of Phase I is to evaluate whether any releases of hazardous constituents represent a hazard to human health and the environment. The U.S. Environmental Protection Agency (EPA) has proposed limits which represent a hazard to human health and the environment (55 FR 30798-30884, July 27, 1990). These limits or successors will be listed in the data summary tables for the hazardous constituents detected in one or more samples. Concentrations which exceed the limits will be highlighted in boldface type in the data summary tables. A footnote to the tables will explain the meaning of the boldface type.

Graphical displays will be used to highlight the most critical information collected during the Phase I Release Assessment. The following figures will be included in the RFI Phase I report:

- A facility location map (Figure VII-3-1 or similar)
- Sampling site location maps (figures VII-3-3 and VII-3-4 or similar)
- Facility plot plans with additional information that shows the SWMU or background sampling location,

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constituent, and concentration for all constituents which exceed background (unless too numerous) and/or which exceed the EPA limits indicating possible hazard to human health and the environment.

- Features which affect intramedia transport, and potential receptors
- Areas where more data are required.

Phase I Reporting

Phase I includes a single, extensive sampling and analysis event. A report on this event, including all field observations, laboratory data, and quality assurance evaluations, will be submitted to IEPA within 90 days of receipt of the complete set of soil and ground-water quality data. The Phase I report will provide a summary of the Phase I investigation, problems and responses, staffing changes, and a schedule of upcoming activities.

Quarterly progress reports will be submitted to summarize information regarding percentage of the project completed, activities completed during the reporting period, changes in the implementation of the Workplan, problems encountered during the reporting period, proposed corrections to these problems, project work for the next reporting period, and any other necessary information.

Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of the data required to support decisions made during RFI activities and are based on the end uses of the data to be collected. As such, different data uses may require different levels of data quality. There are five analytical levels which address various data uses and the QA/QC effort and methods required to achieve the desired level of quality. These levels are:

Screening (DQO Level 1): This level provides the lowest data quality but the most rapid results. It is often used for health and safety monitoring at the site, preliminary comparison to ARARS, initial site characterization to locate areas for subsequent and

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more accurate analyses, and for engineering screening of alternatives (bench-scale tests). Screening data on this project include the health-and-safety data generated onsite through the use of a photoionization detector (PID) and explosimeter, and the screening of soils for total organic vapors (TOV) using the PID.

- <u>Field Analyses</u> (DQO Level 2): This level provides rapid results and better quality than in Level 1. This level may include sampling site and mobile lab generated data depending on the level of quality control exercised. No field analyses are scheduled for this project.
- Engineering (DQO Level 3): This level provides an intermediate level of data quality and is used for site characterization. Engineering and analyses include laboratory data used for screening but without full quality control (i.e., cannot satisfy the precision and accuracy objectives in Section 5). No engineering data are scheduled for this project.
- <u>Confirmational</u> (DQO Level 4): This level provides the highest level of data quality and is used for purposes of risk assessment and evaluation of remedial alternatives. These analyses require full RCRA analytical and data validation procedures in accordance with EPA recognized protocol in SW-846. Soil and ground-water samples collected on this project will be routinely analyzed for the target compound list at the confirmational level.
- <u>Non-Standard</u> (DQO Level 5): This level refers to analyses by non-standard protocols, for example, when exacting detection limits or analysis of an unusual chemical compound is required. These analyses often require method development or adaptation. The level of quality control is usually similar to DQO Level 4 data. No non-standard analyses are scheduled on this project.

Project Time Schedule

The project time schedule for Phase I of the RFI is shown on Figure VII-3-5.

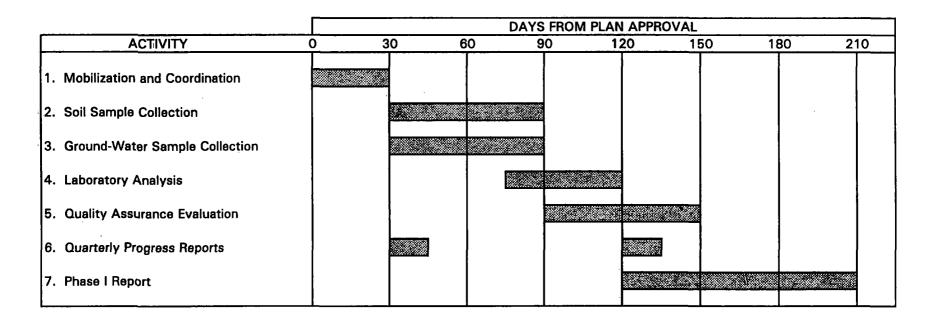


FIGURE VII-3-5 : TIME SCHEDULE, PHASE I RELEASE ASSESSMENT, DOLTON RECYCLE CENTER

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SECTION VII-4

MANAGEMENT ORGANIZATION

Figure VII-4-1 presents the proposed project management structure for the implementation of the RFI. The project will be directed by Mr. Scott Davies, Senior Project Manager - Remediation for Safety-Kleen Corp. (S-K). Mr. Davies has 8 years of experience in the environmental field and is responsible for cleanups and closures of S-K recycle centers throughout the United States and Puerto Rico.

Mr. Davies will be assisted by John Valerius, the Facility Manager at the Dolton Recycle Center. Mr. Valerius has more than 15 years of experience in waste management.

The IEPA Project Coordinator (Eric Minder) will ensure that the RFI project is conducted in accordance with the RCRA regulations and in general accordance with RFI guidance documents. The IEPA Project Coordinator will modify the RFI Workplan as needed, make site visits, and critically review the final report to ensure that the quality assurance objectives have been achieved.

The IEPA Project Coordinator and the S-K Project Director may conduct audits of field and laboratory activities.

S-K has developed an experienced project team in order to promote quality assurance during the RFI process. All team members have worked together on RFIs at other petroleum-impacted sites. The principal team members are:

- TriHydro Corporation will function as the prime contractor. TriHydro will be responsible for the proper implementation of the Phase I Workplan, collecting soil samples and submitting them to the laboratory, auditing laboratory performance, and preparation of the RFI report. In addition to working with S-K at the Dolton site, TriHydro is conducting assessment and/or remediation projects at 40 other S-K sites throughout the central and western United States.
- <u>GEO Corporation</u> will perform the drilling services. GEO Corporation has the specialized equipment to enter and drill in tight locations and has experience in drilling at petroleum-impacted sites.

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• <u>S-K Environmental Laboratory</u> will perform all laboratory analytical services. S-K Environmental Laboratory is performing the analytical services on many of S-K's monitoring, assessment, and remediation projects in the region.

TriHydro Corporation

John Ahern, President of TriHydro Corporation, will be TriHydro's project manager for the RFI Phase I project. Mr. Ahern has 20 years of experience in assessment and remediation at petroleum-impacted sites. He has served as project manager and/or QA/QC officer on 25 Safety-Kleen projects over the previous two years. Mr. Ahern is located at the TriHydro Corporation office in Laramie, Wyoming, and will provide all onsite project personnel from this office.

Activities to be performed by the Project Manager during the RFI include:

- Select, coordinate, and schedule staff for the work assignments.
- Control budgets and schedules.
- Prepare bimonthly progress reports.
- Monitor the subcontractor.
- Implement quality assurance measures and any corrective action requirements.
- Attend review meetings.
- Perform final data assessment.
- Supervise the preparation of the RFI report and provide technical peer review.

Under the direct supervision of the project manager is the QA/QC officer and the site manager. Mr. John Schneider will serve as the project QA/QC officer. The activities presented below will be completed by the project QA/QC officer:

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- Audit field memoranda prepared by field personnel to assure that the procedures for sample collection and sample custody are strictly adhered to.
- Review laboratory reports to assure that adequate QA/QC procedures are imposed on the laboratory analytical results.
- Interface with IEPA's QA Officer and Project Manager, when necessary.
- Organize the final evidence file, and turn over the custody of this evidence file to S-K's Project Manager at the end of the project.

Mr. Tom Nissen will serve as the project's site manager. Mr. Nissen has six years of experience directing field activities for environmental assessment and remediation at RCRA facilities. Mr. Nissen will be responsible for all onsite activities including scheduling, direction of the subcontractors, and maintaining the sampling procedures in accordance with the Quality Assurance Project Plan (Part VII) and the Sampling and Analysis Plan (Part IV).

GEO Corporation

GEO Corporation will conduct the soil and ground water sample collection required during the RCRA Facility Investigation. Geo Corporation has custom-designed equipment for field sampling and can match the field sampling equipment to the particular task, type of sample needed, and site conditions. During the Phase I investigation, a Scorpion Series ATV Hydraulic Probing Rig will most likely be used to allow access to the warehouse SWMUs. A detailed explanation of soil and ground-water sample collection is described in the Sampling and Analysis Plan (Part IV).

S-K Environmental Laboratory

S-K Environmental Laboratory will conduct the laboratory services required during the RCRA Facility Investigation. The laboratory organization structure and internal responsibilities are described in detail in Appendix VII-A.

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SECTION VII-5

QUALITY ASSURANCE OBJECTIVES

The quality assurance objectives provide quantitative and qualitative measures of the ability to produce high-quality results through a properly designed sampling and analysis program. The objectives of the overall quality assurance/quality control (QA/QC) program are to:

- Ensure that all procedures are documented, including any changes from the Workplan protocol.
- Ensure that all sampling and analytical procedures are conducted according to sound scientific principles.
- Monitor the performance of the field sampling team and laboratory with a systematic audit program and provide for corrective action necessary to assure quality.
- Evaluate the quality of the analytical data through a system of quantitative and qualitative criteria.
- Ensure that all data and observations are properly recorded and archived.

This chapter addresses the qualitative and quantitative criteria which will be used to evaluate the quality of the analytical data.

Level of Quality Control Effort

The level of quality control effort will be consistent with that required under SW-846 for a RCRA investigation. The level of effort for each quality assurance sample type is described in detail in Section 5.0 of Appendix VII-A, and summarized below:

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- 1. <u>Background Samples</u>. Eight soil samples and four ground-water samples to establish background conditions created by natural concentrations of the constituents as well as by sampling and laboratory interferences in the medium matrix, if any.
- Blind Duplicate Samples. One for every 10 investigation samples received.
- 3. Trip Blanks. One for each cooler of aqueous samples.
- 4. <u>Equipment Blanks</u>. One for every 10 investigative aqueous samples received.
- 5. <u>Matrix Spike/Matrix Duplicate</u>. One for every 20 investigative samples received.
- 6. <u>Surrogate Spiking</u>. Added to all samples prior to extraction and analysis.

Quantitative Measures

Four quantitative measures of quality will be employed during the RFI Phase I Release Assessment:

- Method Detection Limits (MDLs)
- Precision
- Accuracy
- Completeness

The quality assurance objectives for these criteria and procedures to compare calculated values to the objectives are described in Section VII-14. The measures are defined below.

Method Detection Limits

Method detection limits (MDLs) are the lowest concentrations of analytes in the environmental samples that can be reliably determined within specified limits of precision and accuracy by specified analytical methods under routine laboratory operating conditions. MDLs are a function of sample type (soil or water), analytical method, and matrix interferences.

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Precision

Precision is the degree of agreement between the numerical values of a set of replicate samples performed in an identical fashion. Precision will be based on the analytical data from the internal laboratory replicate analyses. Precision will be reported as relative percent difference as expressed by the following formula:

RPD =
$$\frac{(C_1-C_2)}{(C_1+C_2)/2} \times 100\%$$

 C_1 and C_2 are the concentrations of duplicate samples.

Accuracy

Accuracy is the measure of a result to the accepted (or true) value. Errors may arise from personal, instrumental, or methods factors. Accuracy is assessed by means of referenced samples, percent recoveries on matrix spikes and surrogate spikes, and method blanks. Analytical accuracy is expressed as the percent recovery of an analyte that has been added to the sample or laboratory-prepared blank at a known concentration before analysis, and is expressed by the following formula:

Accuracy =
$$Recovery = \frac{A^T - A^0}{A^F} \times 100\%$$

Where:

 A^{T} = Concentration of spiked sample

 A^0 = Concentration of sample A^F = Concentration of spike

The spiked concentration is specified by laboratory quality control requirements.

Completeness

Completeness is a measure of the percentage of analytical data points that meet all the acceptance criteria for method detection limit, precision, and accuracy. Completeness is the ratio of the number of validated sample analyses to the total number of sample results required by the Workplan:

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Completeness = Number of Validated Sample Analyses
Number of Sample Results Required by
Workplan

The ability to meet or exceed a completeness objective is dependent on the nature of samples submitted for analysis. If data cannot be reported without qualifications, project completeness goals may still be met if the qualified data, i.e., data of known quality even if not perfect, are suitable for specified project goals.

<u>Oualitative Measures</u>

Two qualitative measures of quality will be employed during the RFI Phase I Release Assessment:

- Representativeness
- Comparability

These terms are defined below, and procedures to achieve representativeness and comparability are described.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an environmental condition. Representativeness is a qualitative parameter which is dependent upon the proper design of the sampling program and proper laboratory protocol.

The sampling network was designed to provide data representative of worst-case site conditions at each solid waste management unit. During development of this network, consideration was given to areas of known releases, areas where previous field screening data indicated impacts, and areas where experience from similar sites indicates releases of hazardous waste and hazardous constituents are most likely to occur. The rationale of the sampling network is discussed in detail in the Sampling and Analysis Plan (SAP), presented in Part IV of the Workplan.

Representativeness will be satisfied by ensuring that the SAP is followed, proper sampling techniques are used, proper analytical procedures are followed, and holding times of the

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samples are not exceeded in the laboratory. Representativeness will be assessed by compliance with the Workplan protocol and by the analysis of the blind duplicate samples.

Comparability

Comparability expresses the confidence with which one data set can be compared with another. Data from background sites and SWMUs will be comparable, because the same standardized procedures will be used to collect and analyze samples. These procedures, described in this Quality Assurance Project Plan, are based on the industry standards expressed in SW-846. Comparability will be judged by compliance with the Workplan protocol.

The extent to which previous, existing, and planned analytical data will be comparable depends on the similarity of past, current, and future sampling and analytical methods. Past and future analytical data may not be directly comparable to data to be collected under this Workplan because of differences in procedures and quality assurance objectives.

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SECTION VII-6

SAMPLING PROCEDURES

The soil and ground-water samples to be analyzed are shown in Table VII-6-1. Safety-Kleen Corp. intends to collect four background soil samples of each soil texture encountered, 46 to 50 solid waste management unit (SWMU) soil samples, 23 to 25 SWMU ground-water samples, five blind duplicate soil samples, three blind duplicate ground-water samples, three trip blanks, and three equipment blanks during the Phase I RFI Release Assessment. The procedures to collect soil and ground-water samples are described in this section. The field procedures include:

- Pre-field coordination and preparation activities
- Equipment decontamination
- Sample collection
- Field screening
- Field documentation
- Post-field activities.

Pre-Field Activities

Several activities will be conducted prior to departure for the project site. A project team is assigned and the members will begin coordinating the sample collection event with the Dolton facility, the laboratory, and regulatory agencies. Field equipment will be checked and organized. Pertinent health and safety criteria will be reviewed along with the Health and Safety Plan (Part V). Site access will be checked with John Valerius (Dolton facility site representative), and provisions will be made to pack the necessary equipment for delivery to the project site.

Table VII-6-1. Sampling and Analysis Matrix, RFI Phase I Workplan, Dolton Recycle Center.

				Investigati	ve Samples		Field Qua	ality Contro	l Samples
Sample Matrix	Field Parameters	Lab Parameters	Туре	No. of Sites	No. per Site	Total	Trip Blanks	Equipment Blanks	Field Duplicates
Soil	Physical Descriptions	-			 	 			
	Total Organic Vapors		BG Swmu	4 23-25	2	8 46-50	0	0	5
		Volatile Organic Compounds Semi-Volatile Organic Compounds Inorganic Compounds, Total	BG SWMU	4 23-25	2 2	8 46-50	0	0	5
		BG SWMU	4 23-25	1 1	4 23-25	Ō	0	3	
	Physical Descriptions			Ĭ					
		Volatile Organic Compounds Semi-Volatile Organic Compounds Inorganic Compounds, Dissolved	BG SWMU	4 23-25	1	4 23-25	3	3	3

Notes:

- No. 1. The number of sites depends on whether a SWMU is present in the Barker Chemical No. 2 Area on S-K property, and thus is subject to this investigation.
 - 2. Laboratory control samples are described in Appendix VII-A.
 - 3. BG means background, and SWMU means solid waste management unit.

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Project Team

The sampling project team will consist of the project manager, the site manager, and field team (if necessary). The qualifications and responsibilities of individual project team personnel with respect to the field activities are:

1. Project Manager

- a. Schedule the sampling event;
- b. Assign qualified personnel to the field team;
- Monitor sampling activities to ensure compliance with the Workplan (calls from field personnel, etc.); and
- d. Review field data and chain-of-custody/sampleanalysis-request records to ensure compliance with the Workplan.

2. Site Manager

- a. Knowledgeable in sampling techniques;
- b. Knowledgeable in operation and maintenance of instruments;
- c. Knowledgeable about project health and safety plan and procedures; and
- d. Responsible for:
 - i. Ensuring compliance with the Workplan;
 - ii. Preparations for sampling event;
 - iii. Ensuring the proper equipment is available
 and operating;
 - iv. Assigning field team members' responsibilities and overall supervision (if necessary);
 - v. Onsite client contacts;
 - vi. Logging field data;
 - vii. Shipping or transporting samples;

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viii.Chain-of-custody/sample-analysis-request
 forms; and

ix. Laboratory contact.

3. Field Team Members

- a. Knowledgeable in sampling techniques;
- b. Knowledgeable about the project health and safety plan;
- c. Able to calibrate and operate instruments properly;
- d. Log data acquired during sampling; and
- e. Assist the sampling supervisor as necessary.

Preparation

The project site manager will review the RFI Phase I Workplan and related correspondence to determine if any plans or reports need to be brought to the site during monitoring, if any changes have been made to the sampling and analytical procedures, and if any groups need to be contacted about sampling observation or split sampling. At a minimum, the Illinois Environmental Protection Agency (Eric Minder) will be contacted seven to 14 days prior to sampling about the sampling schedule.

Dolton facility (John Valerius or designate) will be contacted to confirm the expected arrival time at the site and expected departure time. The laboratory will be informed when sample coolers are expected to arrive and the method and location of arrival.

All sampling and monitoring equipment will be inspected prior to departure to ensure that it is in proper working order. The necessary health and safety monitoring equipment is described in detail in the Health and Safety Plan (Part V).

Equipment Inventory

The following equipment and supplies may be used for soil sampling:

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o Soil Sampling

- Concrete cutter or electric rotary hammer drill and bits
- Brass rings, teflon sheets, and plastic caps
- Glass jars (2 or 4 ounce and 32 ounce) with teflon-lined lids
- Photoionization detector
- Soil sample extruder
- Bentonite
- Asphalt and concrete patch
- Marking pen, labels
- Hexane
- Non-phosphate detergent and scrub brush
- Decontamination containers and brushes ash, rinse, rinse)
- Distilled or deionized water
- Protective gloves
- Plastic sheeting
- Coolers with ice
- Plastic bags for sample containers and ice

o <u>Ground-Water Sampling</u>

- Manometer for fluid levels
- Sampling pump
- Tarps
- Filtration unit, nitrogen tank, regulator, filters
- Disposal gloves

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- Buckets for water disposal
- Sample bottles with preservatives
- Coolers with ice
- Distilled water

o Health and Safety

- Photoionization detector
- Combustible gas meter
- Benzene detector tubes
- Respirators with organic cartridges
- Dust protection masks
- Hard hats and safety glasses
- Tyvek suits
- Appropriate shoes or boots

Safety Procedures

The project site manager will review the Health and Safety Plan (Part V), and make copies of the Plan available to all field team members. The project site manager will inform all field team members immediately before monitoring of the kinds of contaminants found or expected to be found at the site, and the possible hazards.

The project site manager will be responsible for bringing the appropriate safety equipment to the sampling site. All field team members will be knowledgeable in the operation of necessary safety equipment. Each field team member is responsible for 1) bringing appropriate safety equipment to each sampling site during monitoring, 2) making the equipment immediately available for use, 3) recognizing safety or health hazards, and 4) undertaking the appropriate safety precautions.

The field team will consist of a minimum of two people at or in the general vicinity of the sampling site. If a field team member will be out of visual contact with the other member(s) of the sampling party, he or she will inform the

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project site manager of his/her location before heading to the sampling site.

Access Control

Protective measures will be employed for limiting access to the sampling sites during sampling. The project site manager (or designate) will be present at each sampling site during the entire sampling period. The project site manager will be responsible for controlling any activities that might influence the integrity of the soil collection procedures.

Sample Collection Procedures

The project site manager will implement the monitoring required under the Health and Safety Plan (Part V of the Workplan). Soil and ground-water sampling devices are described in Appendix IV-A. Sampling procedures are described below.

Soil Sampling

Concrete or asphalt will be removed (if appropriate), and soil sample collection will commence with GeoProbe or equivalent equipment using the following procedure:

- 1. A new or decontaminated brass liner assembly will be placed into a stainless steel sampler (called a Kansas sampler). Samplers are 1 to 2 feet in length.
- 2. The sample (decontaminated) will be attached to drive rods which are 3 feet in length.
- 3. The sampling tool will be hydraulically advanced to the sampling depth.
- 4. The tool will be opened and driven 1 to 2 feet to fill the liner with a soil sample.
- 5. The tool will be hydraulically withdrawn to the surface.
- 6. The brass liner will be broken manually into sections by a field team member wearing sterile gloves.

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- 7. The uppermost section will be discarded, because it may contain borehole slough.
- 8. Two sections will be capped with Teflon sheets and slip-on plastic caps, marked with a sample number, and placed in an opaque cooler on ice immediately upon collection. Care will be taken to minimize headspace during this procedure. Sample collection will adhere to IEPA "Soil Volatile Sampling Procedures" (Appendix IV-B), except that Teflon sheeting rather than aluminum foil will be used to seal the brass rings.
- 8. The soil in the remaining section will be subjected to field screening procedures described in a subsequent section.

One soil sample, consisting of three to four brass rings (or more, if necessary), or two to three 2- or 4-ounce glass jars if soil lacks sufficient cohesion, will be collected from each sampling interval. In addition, blind duplicate samples will be collected from five of the SWMU sites for quality assurance analyses. The brass rings or glass jars will be used for analysis of volatile organic compounds, semi-volatile organic compounds, and eight inorganic constituents.

Ground-Water Sampling

Phase I ground-water sampling will be conducted using a GEO Environmental ATV/Geoprobe hydraulic sampling rig or equivalent. In this method, an expendable point will be driven into the ground water within the perched zone, and the probe rods will be extracted to expose a dedicated perforated 3/8-inch teflon tube. The depth to ground water in the tube will be measured with a manometer. The elevation of the top of the tubing will be surveyed to the nearest 0.1 foot by a licensed land surveyor to convert depth to water to a ground-water elevation in feet above mean sea level.

Ground water will be sampled using a peristaltic or inertia pump. Three volumes of water column in the tubing will be purged, and the required sample taken. Ground-water samples will be collected in order of decreasing volatility: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and inorganic constituents. Water to be analyzed for VOCs will be pumped with minimal agitation into a 40-milliliter VOA glass bottle, and all headspace will be eliminated. Water to be analyzed for SVOCs will be pumped with minimal agitation

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into liter glass bottles filled as completely as possible. Water to be analyzed for inorganic constituents will be pumped into the filtration chamber, and then filtered with pressurized nitrogen into a 500-milliliter plastic bottle containing preservatives.

Hole Patching

Soil and concrete will be stockpiled with other demolition debris from the facility, and hauled to a suitable offsite disposal facility. Sampling locations will be plugged by pouring bentonite granules down the hole and hydrating in approximately 1- to 2-foot lifts to the surface. The surface will be repaired to matching grade. A concrete patch will be placed over the sampling location in areas where concrete is present and asphalt patch will be placed over the sampling location in areas where asphalt is present.

Field Screening

One aliquot of soil from each sampling interval will be screened in the field to evaluate the nature and degree of impact. Field screening includes physical descriptions by the onsite geologist and measurements of total organic vapors (TOV) with the photoionization detector (PID).

Soil from each sampling depth will be extracted from one brass liner into a ziplock bag and brought to room temperature. The PID probe will be inserted into the bag, and the highest TOV reading measured by the PID will be recorded. A Thermo Environmental Model 580B PID equipped with a 10.0 eV lamp (or equivalent) will be used during field screening. The PID will be calibrated with a 100 parts per million (ppm) isobutylene standard at the beginning of each day and periodically during the day. The soil will also be described by the onsite geologist in terms of texture (per ASTM Method D-2488), moisture content, staining, and any other pertinent information.

Capped samples from each interval will be held in a cooler or refrigerated at the site until it is determined which samples will be sent to the laboratory. The objectives of the soil sampling program are to define the nature, degree, and vertical extent of soil quality degradation in the unsaturated zone. To achieve the soil sampling program objectives, Safety-Kleen will submit for laboratory analysis the following soil samples from

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above and below the shallow perched saturated zone of each borehole:

- 1. A sample from immediately below the ground surface (1-3 feet) to define nature and degree.
- 2. A sample in the clay aquitard at a depth of ±20 feet below ground surface to define vertical extent.
- 3. If field screening indicates possible impact at the deep sample interval (based on field screening), a second sample may be submitted from the interval below the possible impact.

The laboratory samples will be packaged, placed on ice in a cooler (maintained at about 4°C), and delivered within 24 hours of sampling to the S-K Environmental Laboratory for analysis. Soil samples will not be composited. All samples will be accompanied by completed chain-of-custody/sample-analysis-request forms.

Decontamination Procedures

Brass rings will be decontaminated prior to sampling, either in the laboratory or in the field. Brass rings will be cleaned according to the procedures described below. Glass containers will be pre-cleaned and supplied by an independent supplier. The sampling devices will be decontaminated in the field immediately prior to and after sampling each site. Sampling equipment will be disassembled into component parts prior to washing.

Field decontamination will include washing the sampling devices and brass rings and caps in a warm non-phosphate detergent solution, rinsing the devices and containers with tap water, and then rinsing the devices with distilled or deionized water. In addition, the detergent solution and rinsewaters will be pumped through the ground-water sampling pump. Sampling devices and containers will be dried before use by air drying or with clean paper towels. If a hydrocarbon sheen becomes present on the rinse water during decontamination, the sampling devices and/or containers will be decontaminated again with hexane, fresh wash and rinse water. All washing fluids and rinse water will be containerized at the Dolton facility for proper processing by S-K.

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The decontaminated sampling devices and brass rings will be stored in clean containers, plastic bags or ziplock-type bags until use. The brass rings and sample containers may be stored until use in coolers.

Field Documentation

Field observations are critical to the verification and interpretation of the laboratory data. Field observations during soil sampling will be recorded in the field log book. The following information will be recorded in the field notebook where appropriate:

- Date and name of observer
- Names and affiliations of sampling team members
- Names and affiliations of others present at the sampling sites
- Weather conditions
- Sampling location (with measured distances) and time of sampling
- Health and safety data on total organic vapors and combustible gas concentrations.
- Health and safety measures implemented (e.g., respirators)
- Sampling site condition upon arrival (concrete cover, standing water, erosion, etc.)
- Soil characteristics and texture
- Depth to ground water
- Volume purged from ground-water sampling device, and response of fluid levels to pumping
- Soil and ground-water observations, including discoloration, hydrocarbon sheens, moisture content, etc.
- Deviations from or clarifications of sampling procedures in the Workplan

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 Miscellaneous conditions which the sampling team finds noteworthy

The project site manager will review and sign the field notes after each day of sampling.

Photographs will be taken of every sampling site. Photographs will also be taken of sampling procedures at one location.

Post-Field Activities

The project site manager and field team members are responsible for several activities after the samples have been shipped to the laboratory. The post-field responsibilities include laboratory contact, record filing, and equipment checks.

Continued Supervision

The project site manager will call the laboratory on the day the samples are due to arrive at the laboratory to ensure that they have in fact arrived. The project site manager will call the laboratory periodically to make sure that samples are being analyzed within the following holding times:

Volatile Organic Compounds 14 days

Semi-Volatile Organic Compounds 14 days until extraction, 40 days af-

ter extraction

Inorganic Constituents (except Mercury) 6 months

Mercury 28 days

Records

The project site manager will collect all pertinent field data (i.e., chain-of-custody, copies of field logbook records, etc.) and file it in the client job file immediately after returning from the field. Proper and efficient management of the sampling records will aid in reviewing and evaluating the laboratory analytical data. The project site manager will also ensure laboratory data are placed in the project file.

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Equipment

Any equipment problems noted during sampling and not corrected in the field will be corrected upon return to the office. Broken or contaminated equipment will not be returned to storage for future use.

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SECTION VII-7

SAMPLE CUSTODY

In this section are described the procedures to maintain custody of the samples from sample collection through laboratory analysis to the final evidence files. A sample or evidence file is in one's custody if it is:

- In one's physical possession
- In one's view, after being in one's possession
- In one's physical possession and placed in a secured location
- In a secured area restricted to authorized personnel only

As few people as practical will have custody of the samples to reduce the chance of mishandling.

Field Chain-of-Custody Procedures

Field chain-of-custody will be maintained through the use of field logbooks, sample labels, chain-of-custody/sample-analysis-request forms, and custody seals. The project site manager will be responsible for the successful implementation of these procedures.

Field logbooks will be bound field survey books and assigned to field personnel. Copies of the field observations will be made immediately upon return to the office and placed into the project file.

Each sample container will be identified with a label. The sample label will be the one shown on Figure VII-7-1 or equivalent. The information which will appear on the sample container label includes:

- 1. Sample identification number
- 2. Place of collection (or project number)

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	SAMPLED BY	DATE		
	A STATE OF THE STA	TIME		
	LOCITION	PRESERVATIVE		
	ANALYSIS	CLIENT		
9601 San Leandro Street, Oakland, California 94603 (510) 562-4988 (800) 233-8425				

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- 3. Date and time of collection
- 4. Personnel collecting the sample
- 5. Preservative (none in the case of soil samples)
- 6. Analyses requested
- 7. Any special information, such as an estimate of the level of contamination

The brass rings or 2-4 ounce glass jars will be used for analysis of volatile organic compounds, semi-volatile organic compounds, and eight metals.

All samples will be accompanied by completed chain-of-custody/sample-analysis-request forms (Figure VII-7-2). The project site manager will keep a copy of this completed form, and another copy will be kept at the Dolton facility. The chain-of-custody part of the form provides documentation necessary to trace sample possession continuously from the time of collection until the time of receipt in the laboratory, and the condition of the samples and sample container upon receipt. The sample-analysis-request part of the form documents the analyses to be performed by the laboratory in addition to any special handling or preservation techniques carried out by the field personnel.

If and when the samples leave custody of the sampling team, the shipping container will be sealed with a custody seal to ensure that the samples have not been disturbed during transportation to the laboratory. The laboratory personnel receiving the coolers will note the condition of the seal and the sample containers within on the chain-of-custody/sample-analysis-request form.

<u>Laboratory Chain-of-Custody Procedures</u>

S-K Environmental Laboratory assumes responsibility for the integrity and security of the samples after proper custody transfer is completed from the sampling team or the transportation service (if appropriate) to the laboratory. The laboratory custody procedures are described in Section 7.1 of Appendix VII-A.

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Final Evidence Files

TriHydro Corporation is the custodian of the evidence file, and will maintain the contents of evidence files for the RFI Phase I investigation while it is being conducted. The evidence will be stored in the project file at the TriHydro office in Laramie, Wyoming. Evidence will include copies of the field logs (Section VII-6), photographs (Section VII-6), completed chain-of-custody/sample-analysis-request records (Section VII-7), and the laboratory data report (Section VII-11). All of this evidence will be included in the RFI Phase I Report.

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SECTION VII-8

CALIBRATION PROCEDURES AND FREQUENCY

This section describes the procedures for maintaining the accuracy of all instruments and measuring equipment which will be used for conducting field tests and laboratory analyses. Instruments and equipment will be calibrated with sufficient frequency and in such a manner that accuracy of results is maintained.

Field Instruments and Equipment

The only field instruments or equipment requiring calibration are the combustible gas meter and the photoion-ization detector (PID). The combustible gas meter and PID will be used in health and safety monitoring (Part V), and the PID will be used for field screening. Each instrument will be calibrated at the beginning of each day of sampling with the following calibration gases:

- 1. A pentane gas standard for the combustible gas meter. The pentane standard provides an appropriate response in a petroleum-impacted area.
- 2. A 100-ppm isobutylene standard for the PID. Isobutylene provides a similar response to benzene, which is the target compound, but is less toxic and thus safer to handle in the field.

The instruments will be recalibrated as needed during the day if responses do not appear accurate.

Laboratory Instruments and Equipment

Most of the analytical work on this project will be performed by the laboratory. S-K Environmental Laboratory provides detailed information on calibration procedures and frequency in Section 8.0 of Appendix VII-A.

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SECTION VII-9

ANALYTICAL PROCEDURES

Samples will be submitted to S-K Environmental Laboratory for chemical analysis. The laboratory is located in Elk Grove Village, Illinois. The S-K Environmental Laboratory is certified and qualified to perform the necessary analyses, as described in Part III.

Samples To Be Analyzed

The samples to be analyzed are shown in Table VII-9-1. The procedures to select soil samples for laboratory analysis are described in the previous chapter under "Field Screening." As shown in Table VII-9-1, duplicate soil and water samples, trip blanks, and equipment blanks will be collected and submitted to the laboratory for quality assurance. As discussed in Appendix VII-A, additional quality assurance samples will be prepared in the laboratory for chemical analysis quality control.

Constituent List

The samples will be analyzed for the 107 constituents described in Table VII-9-2. The full constituent list is presented in Appendix VII-B. The constituent list consists of eight inorganic constituents, 37 volatile organic compounds (VOCs), and 62 semi-volatile organic compounds (SVOCs). The constituent list includes:

- All hazardous constituents detected in soils and ground water during previous sampling events at the Dolton facility.
- All hazardous constituents and hazardous waste constituents detected in wastes managed at the Dolton facility.
- Other VOCs and SVOCs commonly analyzed by the S-K Environmental Laboratory using Methods 8240 and

Table VII-9-1. Sampling and Analysis Matrix, RFI Phase I Workplan, Dolton Recycle Center.

				Investigat	ive Samples		Field Que	ality Contro	Samples
Sample Matrix	Field Parameters	Lab Parameters	Туре	No. of Sites	No. per Site	Total	Trip Blanks	Equipment Blanks	Field Duplicates
Soil	Physical Descriptions	· · · · · · · · · · · · · · · · · · ·						<u> </u>	
	Total Organic Vapors		BG Swmu	4 23-25	2 2	8 46-50	0	0	5
		Volatile Organic Compounds Semi-Volatile Organic Compounds Inorganic Compounds, Total	BG SWMU	4 23-25	2 2	8 46-50	0	0	5
Ground Water	Water Levels		BG SWMU	4 23-25	1 1	4 23-25	0	0	3
	Physical Descriptions								
		Volatile Organic Compounds Semi-Volatile Organic Compounds Inorganic Compounds, Dissolved	BG Swmu	4 23-25	1	23-25	3	3	3

Notes:

- 1. The number of sites depends on whether a SWMU is present in the Barker Chemical No. 2 Area on S-K property, and thus is subject to this investigation.
- 2. Laboratory control samples are described in Appendix VII-A.
- 3. BG means background, and SWMU means solid waste management unit.

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Table VII-9-2. Constituent List, RFI Phase I Release Assessment, Dolton Recycle Center.

Constituent	Method (from SW-846)	Method Detection Limit (mg/kg)
Inorganics		
Arsenic	7060	1.25
Barium	6010	2.0
Cadmium	6010	2.0
Chromium	6010	4.0
Lead	6010	11.0
Mercury	7471	0.04
Selenium	7740	0.9
Silver	6010	3.0
<u>Organics</u> *		
Volatile Organic Compounds (37)	8240	0.005-0.100
Semi-Volatile Organic Compounds (62)	8270	0.33-3.3

^{*} A complete list of organic compounds and method detection limits for individual compounds are presented in Appendix IV-B.

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8270 (gas chromatography/mass spectroscopy), respectively.

Analytical Methods

All analyses will be conducted for the total concentration of each constituent, except that inorganic constituents in ground-water samples will be analyzed for the dissolved fraction because of the high silt content expected in the samples. Analytical methods are referenced in Table VII-9-2, and contained in Appendix VII-C.

The laboratory will attempt through these standardized analytical methods to achieve the method detection limits (MDLs) listed in Table VII-9-2 and Appendix IV-B. However, MDLs are highly matrix dependent. Because Phase I focuses on the most impacted soils (and ground water), matrix interferences are anticipated. EPA's SW-846 lists modified MDLs for certain methods given matrix interferences (see Table VII-9-3). These modified MDLs will be used to determine completeness.

Holding Times

The laboratory will be instructed to meet the following holding times:

Constituent	Maximum Holding Time
Metals	6 months, excluding mercury (28 days)
VOCs	14 days
SV0Cs	14 days until extraction, 40 days after extraction

The laboratory will be requested to provide a laboratory data report within 45 days of sample receipt.

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Table VII-9-3. Revised Method Detection Limits Due to Matrix Interferences, RFI Phase I Release Assessment, Dolton Recycle Center.

Analytical Method	Matrix	Method Detection Limits			
8240 (VOCs)	Clean and low-level soils High-level soils Clean and low-level ground water	See MDLs in Appendix IV-B Multiply MDLs by 125 See MDLs in Appendix IV-B			
	Medium-level and high-level ground water	Multiply MDLs by 50			
8270 (SVOCs)	Clean and low-level soils	See MDLs in Appendix IV-B			
	Medium-level and high-level soils by sonication Ground water	Multiply MDLs by 7.5 See MDLs in Appendix IV-B			

Note: These revised method detection limits are based on information in SW-846.

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Quality Assurance Procedures

Background samples, blind duplicate samples, aqueous trip and equipment blanks, and laboratory-prepared quality assurance samples will be analyzed by the laboratory during the Phase I Release Assessment to evaluate quality control. The quality assurance procedures are described in detail in Part VII of this Workplan.

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SECTION VII-10

INTERNAL QUALITY CONTROL CHECKS

Internal quality control checks are inserted into the quality assurance process to enhance the precision and accuracy of the data. Field and laboratory internal quality control checks are described below.

Field Checks

Field checks include calibration to evaluate the accuracy of the data, and blind duplicate samples to evaluate the precision and representativeness of the data. Field calibration procedures are described in Section VII-8 of this Part.

Blind duplicate soil samples will be collected from five SWMU sampling locations. The duplicates will be handled in the same manner and analyzed for the same constituents as the SWMU samples. Data from the blind duplicates will be used to evaluate the representativeness of the data.

Laboratory Checks

Laboratory checks are described in detail in Section 11.0 of Appendix VII-A. For inorganic analyses, these internal checks include calibration curves, calibration blanks, continuing calibration verification, ICP interference check sample analysis, preparation blank analysis, sample spike analysis, sample duplicate analysis, laboratory control sample analysis, and ICP serial dilution analysis.

For organic analyses, internal checks include duplicate matrix spikes and reagent water blanks. Performance goals for organic constituents are established in Sections 11.4 and 11.5 of Appendix VII-A.

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SECTION VII-11

DATA REDUCTION, VALIDATION, AND REPORTING

This section covers procedures to compile, validate, and report the data collected during the RFI Phase I release assessment. Both field and laboratory procedures are discussed.

Data Reduction

The field data collected will be field observations (see Section VII-6 of this Part) and health and safety data (see Part V). Data and observations will be recorded in the field logbook. No data reduction will be necessary.

Laboratory data reduction procedures are described in Section 10.0 of Appendix VII-A. Data reduction is performed by the individual analysts and consists of calculating concentrations in samples from the raw data obtained from the measuring instruments.

Data Validation

The site manager will review and sign the field notes after each day of sampling. The objectives of this review are to identify and correct errors in the field notes before the recollection of the field observations becomes dimmed by time. The project manager will review the field audit and field notes, and determine whether the samples were collected and handled according to this RFI Workplan.

Data validation procedures in the laboratory are described in Sections 10.3 through 10.5 of Appendix VII-A. Data validation is a three-step process in the laboratory. The analyst checks the data to verify that the precision and accuracy objectives are satisfied; if not, a corrective action report is filled out and corrective action taken. The QA/QC personnel check the data package to ensure that it is complete and that deviations in protocols are accounted for. The laboratory manager verifies that the final report is printed cor-

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rectly. The contents of the laboratory data package are described under "Data Reporting."

The project manager will conduct a systematic review of the data for compliance with the established quality control criteria based on the spike, duplicate and blank results provided by the laboratory. An evaluation of method detection limits, data precision, accuracy and completeness, based on criteria in Section VII-14, will be performed and presented in the final report.

The project manager will identify any out-of-control data points and data omissions, and interact with the laboratory to correct data deficiencies. Decisions to repeat sample collection and analysis will be made by the project manager based on the extent of the deficiencies and their importance in the overall context of the project.

Data Reporting

A copy of the field notes will be included as an appendix in the RFI Phase I Report. The laboratory data are reported through the laboratory information management system (see Section 10.6 of Appendix VII-A). A copy of the laboratory data report will be included as an appendix in the RFI Phase I Report. The laboratory data report will include:

Inorganics

- o Cover letter with laboratory manager/project manager sign-off
- o Data qualifiers
- o Chain of custody
- o Lab chronicle, describing client ID/analysis, matrix, prep number, collection date, extraction/prep date, analysis date, and section manager sign-off
- o Case narrative if any technical problems oc-
- o Client data report

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Quality control summary reports, including date of analyses, parameters determined, sample duplicates and control samples, IEC factors for the ICAP analyses, method blank detection report, and laboratory control standards report.

Organics

- o Cover letter with laboratory manager/project manager sign-off
- o Data qualifiers
- o Chain of custody
- o Lab chronicle, describing client ID/analysis, RFW number, prep number, collection date, extraction/prep date, analysis date, and section manager sign-off
- o Case narrative if any technical problems oc-
- o Sample data report
- Quality control summary report (spread-sheet), including date of analyses, parameters determined, sample duplicates and control samples, surrogate spike recoveries, matrix spike and matrix spike duplicate results, chromatograms and mass spectra.
- o Raw data package for GC/MS volatiles and semivolatiles

Data reporting also covers the handling of blind duplicates and internal laboratory replicates, outliers, data below method detection limits and quality assurance data. Data from blind duplicates will be individually recorded in the data summary tables of the RFI Phase I Report; these data will be used to evaluate the representativeness of the results.

Internal laboratory replicate data will be averaged during data reduction, and the averages will be presented in the data summary tables of the RFI Phase I Report with a notation that the values represent internal laboratory replicate averages. Individual replicate data will be shown in the labora-

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tory data report, and discussed under precision and accuracy evaluations in the quality assurance part of the RFI Phase I Report.

Any program of environmental measurement can produce outlier numbers that lie outside the "expected" range of values. Outlier values may be the result of:

- A catastrophic unnatural (but real) occurrence, such as a spill;
- Inconsistent sampling or analytical chemistry methodology;
- Errors in the transcription of data values or decimal points; and
- 4. True but extreme concentration measurements.

Documentation and validation of the cause of outliers will accompany any attempt to correct or delete data values, because true but extreme values will not be altered. Outlier values will not be omitted from the raw data reported to the regulatory agency, but will be identified as outliers within the data summary tables. Reasons for the outlying behavior will be provided in the data summary tables or in the text of the RFI Phase I report.

Data below detection limits will be expressed as "ND (method detection limit)," where "ND" means not detected and "method detection limit" is the quantitative value determined by the laboratory.

Quality assurance data will be discussed in detail in a quality assurance section of the Phase I Report. Quality assurance information will be included in other chapters to the extent that it affects the interpretation of sample data.

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SECTION VII-12

PERFORMANCE AND SYSTEM AUDITS

Performance and system audits of field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in this Workplan. This section describes the external audits that will be conducted by Safety-Kleen Corp. (S-K), and the internal field, laboratory, and office audits that will be conducted by S-K contractors.

External Audits

External audits will be conducted by S-K. John Valerius, who is Dolton's Facility Manager, or his designate, will audit the field activities to evaluate whether they are being conducted in accordance with the procedures in this Workplan. Mr. Valerius and/or Scott Davies of S-K will provide peer review of the RFI Final Report.

The IEPA Project Coordinator may conduct audits of field activities. S-K's management personnel or designates will accompany the IEPA personnel during the audits if so desired by the IEPA.

Field Audits

The site manager will schedule audits of field activities at various times to evaluate the execution of sampling operations and field documentation. The evaluation is directed toward the extent to which the Workplan procedures are being followed.

Sampling operations will be evaluated to determine if they are performed as stated in this Workplan. The site manager will perform spot checks to determine that the appropriate number of samples are being collected, samples are placed in proper containers, and proper preservation, packaging, and shipment protocols are being followed.

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The site manager will check to see that chain-of-custody procedures are being followed, and that samples are being kept in custody at all times.

Field documents pertaining to sample identification and control will be examined daily for completeness and accuracy. Field notebooks and field data forms will be reviewed by the site manager to see that all entries are dated and signed and the contents are legible, written in indelible material, and contain accurate and inclusive documentation of project activities.

Safety-Kleen Corp. or the TriHydro project manager will visit the site on at least one occasion during the sampling event to audit compliance with the Workplan protocol. The auditor will complete the form shown as Figure VII-12-1. The completed form will be included in the final report. If deficiencies are identified during the audit, the auditor will make a decision whether to repeat sample collection and analysis based on the extent of the deficiencies and their importance in the overall context of the project.

<u>Laboratory Audits</u>

Laboratory raw data audit procedures are described in Section 12.1 of Appendix VII-A. S-K Environmental Laboratory also conducts periodic evaluations of all quality control data which are not project-specific, but promote a high-quality level of performance by the laboratory on all projects.

Office Audits

Prior to the production of the draft document, the quality assurance officer will review the laboratory data report for apparent errors or inconsistencies. He will work with the project manager to determine whether the laboratory will be asked to reanalyze certain samples for certain constituents.

The preliminary draft report will undergo peer review by TriHydro senior professional staff not involved in the preparation of the report. Errors will be corrected, and a draft report issued to Safety-Kleen Corp. The client will provide

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Figure VII-12-1. Field Audit Form, RCRA Facility Investigation, Dolton Recycle Center.

FIELD AUDIT

Auditor:	Field Personnel
	Site Manager:
Date:	Site Health and Safety Officer:
Location:	
Project:	Field Staff:
Activity:	
Health and Safety	
PID: Precision Check (±30%)	
Accuracy Check (±5%)	
Explosimeter: Precision Check (±30%)	
Accuracy Check (±5%)	
Draeger Tubes:	
Personnel Protection Equipment:	<u> </u>
Incidents:	
Responses:	
Noncompliances with Plan:	
	·
Monitoring Procedures	
Sampling Procedure Noncompliance:	
Decontamination Procedure Noncompliance:	
Field Documentation Noncompliance:	

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Label Noncompliance:

Chain-of-Custody/Sample-Analysis-Request:

Noncompliance:

SWMU Samples:

Background Samples:

Field Duplicate (1/10):

Equipment Blank (1/10):

Trip Blank (1/cooler):

Noncompliances with Plan:

Site Manager, Company, Date

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peer review comments, the draft will be revised, and a final report submitted to the regulatory agencies.

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SECTION VII-13

PREVENTATIVE MAINTENANCE

Instruments and equipment will be maintained in order to promote the generation of precise and accurate data, and to permit the project to proceed on schedule. Preventative maintenance procedures for field and laboratory equipment are described below.

Field Procedures

The cornerstones of the field preventative maintenance program are the checking and calibration of field instruments before they are shipped or carried to the field, and the provision for backup instruments and equipment. The combustible gas meter and photoionization detector (PID) will be checked and calibrated immediately before going to the field. Instruments which cannot be properly operated or calibrated will not be taken to the project site.

Backup duplicate instruments and equipment will be available onsite or within one-day shipment to avoid delays in the field schedule. Critical spare parts will be kept onsite to minimize instrument downtime.

Routine calibration will be conducted according to the procedures in Section VII-8 of this Part. Routine calibration will minimize the potential for inaccurate field measurements.

Laboratory Procedures

Preventative maintenance procedures in the laboratory are described in Section 13.0 of Appendix VII-A. These procedures include a calendar of routine equipment maintenance, instrument maintenance logbooks which document non-routine repair or maintenance, and an inventory of critical spare parts in the laboratory.

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SECTION VII-14

PROCEDURES TO ASSESS DATA DETECTION LIMITS, PRECISION, ACCURACY, AND COMPLETENESS

As discussed in Section VII-5, there are four quantitative measures of data quality:

- Method detection limits
- Precision
- Accuracy
- Completeness

Procedures to assess these measures are discussed below.

Method Detection Limits

Analytical methods are referenced in Table VII-3-1 and contained in EPA's SW-846. The laboratory will attempt through these standardized analytical methods to achieve the method detection limits (MDLs) listed in Table VII-3-1 and Appendix VII-A. However, MDLs are highly matrix dependent. Because Phase I focuses on defining if a release has occurred, is occurring, or could occur, matrix interferences are possible. EPA's SW-846 lists modified MDLs for certain methods given matrix interferences (see Table VII-9-3). These modified MDLs will be used to determine completeness.

In addition to MDLs, the laboratory routinely evaluates instrument detection limits (IDLs) on laboratory-prepared standards. Quality assurance objectives for IDLs are discussed in Section 14.0 of Appendix VII-A.

Precision

Precision will be measured on internal laboratory duplicates by the procedure discussed in Section VII-5. Precision quality assurance objectives are listed in Table 5-2 of Appen-

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dix VII-A. These objectives are based on a large number of quality assurance analyses conducted by S-K Environmental Laboratory on previous RCRA-level projects.

Accuracy

Accuracy in the field will be evaluated by calibration data on the field equipment. Limits are shown on Figure VII-12-1.

Accuracy will be assessed by means of laboratory internal reference samples and percent recoveries. Accuracy quality assurance objectives are listed in Table 5-2 of Appendix VII-A. Accuracy objectives are discussed further in Section 5.1 and of Appendix VII-A. As with precision, the accuracy objectives are based on a large number of quality assurance analyses conducted by S-K Environmental Laboratory on previous RCRA-level projects.

Completeness

Completeness is based on compliance of the sampling program with the Workplan protocol and the analytical program with the MDLs, precision and accuracy objectives. The completeness objective is 95% for the sampling program and for the analytical program. Audits (see Section VII-12) will ensure that the sampling program satisfies the completeness quality assurance objective.

The overall laboratory objective for completeness is to have 95 percent of the data usable without qualification. The ability to meet or exceed this completeness objective is dependent on the nature of samples submitted for analysis. If data cannot be reported without qualifications, project completion goals may still be met if the qualified data, i.e., data of known quality even if not perfect, are suitable for specified project goals.

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SECTION VII-15

CORRECTIVE ACTION

Corrective action may be required for two classes of problems: instrument and equipment problems and noncompliance problems. The problems will be identified by field team members during sampling and by laboratory analysts during the chemical analyses, or by the project managers and quality assurance officers during the audit procedures described in Section VII-12 of this Part. Corrective actions are described below.

Instrument and Equipment Problems

Instrument and equipment problems may occur during sampling and analysis. They will be remediated by:

- Repair or recalibration
- Replacement with backup duplicate instruments or equipment

Nonconformance Problems

Two types of nonconformance problems may arise: deviation from the approved Workplan procedures or inability to achieve the quality assurance objectives discussed in Sections VII-5 and VII-14 of this Part. Deviations from the approved Workplan procedures will be handled in one of two ways:

- 1. Conducting the work again in accordance with the approved Workplan procedures; or
- Demonstrating to IEPA's satisfaction that the noncompliance does not compromise the successful achievement of the Workplan objectives or the quality assurance objectives.

Deviations and corrective actions will be discussed in the RFI Phase I Report.

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The second potential nonconformance problem is the inability of the laboratory to achieve the quantitative quality assurance objectives. A detailed description of laboratory responses to correct these deficiencies is presented in Section 15.0 of Appendix VII-A. If the laboratory cannot correct the deficiencies, they will be handled in one of three ways:

- 1. The laboratory will be asked to re-analyze the analyses in question, if sample holding times have not been exceeded;
- Safety-Kleen Corp. will demonstrate to IEPA's satisfaction that the noncompliance does not compromise the successful achievement of the Workplan objectives; or
- 3. Additional samples will be collected and analyzed to eliminate the noncompliance.

Laboratory noncompliance and corrective actions will be discussed in the RFI Phase I Report.

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SECTION VII-16

QUALITY ASSURANCE REPORTS TO MANAGEMENT

A RFI Phase I Report will be submitted to the Illinois Environmental Protection Agency which addresses quality assurance problems, if any. The RFI Phase I Report will describe the quality assurance problems and the responses proposed or implemented to resolve these problems.

The laboratory quality assurance officer will prepare a package at the completion of the analytical work which covers the following information:

- Data accuracy and precision
- Completeness
- Results of any performance or system audits conducted during the project

The package will include a comparison of the laboratory quality assurance data to the quality assurance objectives, identify noncompliance with the quality assurance objectives, and describe actions to eliminate or accommodate the noncompliance. This laboratory quality assurance report will be included as an appendix to the RFI Phase I Report.

The RFI Phase I Report will include a section on quality assurance. This section will contain a description of any field or laboratory noncompliance with the Phase I or quality assurance objectives stated in Section VII-5, and a discussion of the actions taken to eliminate or accommodate the noncompliance.

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SECTION VII-17

REFERENCES

U.S. Environmental Protection Agency, 1987. Test Methods for Evaluating Solid Waste, Revision 1 (SW-846).

APPENDIX VII-A

S-K ENVIRONMENTAL LABORATORY QUALITY ASSURANCE PROJECT PLAN

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SAFETY-KLEEN QUALITY ASSURANCE PLAN

for

ENVIRONMENTAL ANALYSES

Prepared by: Safety-Kleen Corp. Environmental Laboratory

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Appendix A - Standard Operating Procedures

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3.0 QUALITY ASSURANCE POLICY

The following document provides a summary of the quality assurance program maintained by Safety-Kleen's Environmental Laboratory. This program was prepared in accordance with "Model Quality Assurance Project Plan Region 5 Office of Super Fund, May 91" to ensure the delivery of complete and accurate data of known quality.

An effective quality assurance program is built on a foundation of quality derived Standard Operating Procedures. This approach ensures that each link in the chain of analysis is sound. Safety-Kleen's chain-linked approach affords a means of verifying and documenting performance quality as required by each SOP employed. Analytical quality is further ensured by rigorous periodic Quality Audits conducted by Safety-Kleen's laboratory Quality Assurance Department which is entirely separate and independent of laboratory operations.

Project specific Quality Assurance objectives are addressed on a project by project basis to satisfy client or end user needs. As such, Safety-Kleen endeavors to discuss and define these objectives with each client at the earliest possible stage.

The objective of Safety-Kleen's Environmental Laboratory QA Program is to ensure that all data reported is complete, accurate and of known quality. These three components form the foundation of Safety-Kleen's Environmental Laboratory QA program.

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4.0 ORGANIZATION AND RESPONSIBILITY

It is the objective of Safety-Kleen Corp. to provide an organizational structure that can enhance the attainment of Corporate goals. Quality services, cost competitiveness, client satisfaction, employee gratification and profitable operations are primary Safety-Kleen goals.

4.1 DESCRIPTION OF LABORATORY PERSONNEL RESPONSIBILITIES

Safety-Kleen's Environmental Laboratory, located in Elk Grove Village, Illinois, is a full-service environmental analytical laboratory. A total staff of 200 cople, consisting of laboratory personnel and/or support personnel managed by Mr. Mark A. Harring provide environmental services to industrial and internal clients. The Environmental Laboratory has state certifications for the analysis of soils, waste water and/or drinking water in Connecticut, California, Illinois, Kansas, New York and Wisconsin. Also, all those states that recognize any of the previous mentioned states in reciprocity. We are accredited by the American Association for Laboratory Accreditation (A2LA). This enables the Environmental Laboratory to conduct analyses for internal and client projects throughout much of the country.

4.1.1 PROJECT MANAGEMENT

Safety-Kleen's Environmental Laboratory uses a system of lab managers and project managers to plan, coordinate, execute and monitor project activities. Efficient and effective project management is of prime importance to the successful execution of project establishing and maintaining credibility and lasting value. Project management at Safety-Kleen is the coordinated and cooperative effort of a team, in which each member actively participates in successful project planning and execution. Project Managers are involved from the start in planning the project and time tables. When the client proposal is accepted by the client, the lab project manager will schedule with the client the arrangements for supplying sample containers and a schedule for sampling.

When samples are received at Safety-Kleen's Environmental Laboratory, the sample custodian will verify that all sample container seals are intact, and if so, will sign the chain-of-custody statement accordingly. In the event that it appears chain-of-custody has been broken, the sample custodian will immediately bring it to the attention of the Project Manager who will in turn contact the client for consultation and resolution. Written documentation of the event will be furnished.

The sample custodian will also verify information on the sample labels is the same as that appearing on the chain-of-custody. Any inconsistencies will also be brought to the attention of the Project Manager for immediate resolution with the client. The resolution will be documented in a memorandum to the project file and a copy provided to the clien. After log-in, the samples are stored at 4°C in storage refrigerators until analysis.

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The sample identification information and analyses requested are then logged into the laboratory computer and entered onto the laboratory backlog. The laboratory backlog serves as a guide to the Laboratory Manager, Group Leaders and Project Managers to identify the status of all samples in the laboratory, and is used to ensure that project deliverable requirements are met. The backlog contains the laboratory sample work order number, client name, number of samples received by matrix, number of samples to be analyzed for each requested parameter, due date, type of QC and report requested.

Backlogs are updated daily and reviewed by the Environmental Laboratory Project Manager and group leaders. The responsibility of the Project Manager is to monitor the status of samples using the backlog report, daily status meetings and through status updates from the Laboratory Manager. Use of the backlog allows the Project Manager to track the progress of samples through the various steps of the analytical process and assure timely completion of each task. If for any reason the backlog indicates that sample analyses are not completed within seven days of the due date, the Project Manager will work with the Laboratory Manager and Group Leaders to reassess laboratory priorities to enable timely delivery of the analytical report. The laboratory manager and group leaders have a commitment to maintain project schedules with a goal of 100% on-time delivery of quality data packages. If at any time, a delay in the required project turnaround time is anticipated, the Project Manager will immediately contact the client and inform them of the nature of the problem, the corrective action taken and a revised delivery date for the analytical data report.

A flexible capacity helps the laboratories meet project commitments. The Environmental Laboratory operates two shifts, 5 days per week in many of the service areas. The shifts are 8 hours shifts. Capacity is expanded by using autosamplers on many of the instruments. As demand for specific analytical requirements grows, the Environmental Laboratory has added equipment and full time staff as analytical backlog is identified.

4.1.3 KEY PERSONNEL

The Environmental Laboratory provides ongoing training to maintain the quality of its personnel. The highly trained staff of experienced professional chemists and technicians is the key element in the lab's credibility as a provider of quality environmental testing service. A strong base of experience, organized and managed effectively, results in a value added service product appreciated by our clients. The accompanying Skills Matrix of Key Personnel summarizes the education and experience of the laboratory personnel. The Laboratory personnel assigned to this project have an excellent record of satisfying project requirements. The Group Leaders provide guidance and direction enabling their staff to routinely provide quality test results.

Table 4-1 provides the skills matrix of key laboratory personnel.

Skills Matrix of Key Personnel SAFETY-KLEEN CORP.

Table 4 - 1

February 14, 1994

	DEGREE	YRS LAB EXP	PROJ MNGT	QA/ QC	DATA MNGT	CLP EXP	SW846 EXP	EPA 600 EXP	DOD EXP	A.F. IRP EXP	INDST HYG EXP
<u>Laboratory Manager</u> Mark Hartwig	BS Chem	20	х	`.	х	х	х	х			х
VP Technical James Breece	Ph.D. Chem	31	х	х	х		х	,			
QA/QC Manager Dave Reese	BS Chem	15	х	х	х	х	х	х	х		
Inorganic Group Leader Rita Shah	BS Chem	11	х	х		х	х				х
Organic Group Leader Rick Cook	MS Chem	14	х	х	х	х	x	x			.х
Project Manager Matt Schweik	BS Economics										
Chemist Pravin Patel	MS Chem	11		х			x				
Chemist Atul Shah	BS Chem	23				х	х	X			х
Chemist Mark Scheuer	MS Chem	8				x	х				х

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4.2 ANALYST TRAINING

Refer to Appendix A.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) OBJECTIVES

5.1 GENERAL

The specific QA/QC objectives for this project are summarized in Tables 5-1 and 5-2. The objectives are divided into two groups briefly described below:

5.1.1 PRECISION

The degree of agreement between the numerical values or determinations of a set of duplicate samples performed in an identical fashion constitutes the precision of the measurement. Precision will be reported as relative percent difference as expressed by the following formula:

RPD =
$$\frac{(C_1 - C_2)}{(C_1 + C_2)/2} \times 100\%$$

where:

 C_1 = Numerical value #1

C₂ = Numerical value #2

5.1.2 ACCURACY

Accuracy is the measure of a result to the accepted (or true) value. Accuracy is assessed by means of reference samples and percent recoveries. Error may arise from personal, instrumental, or methods factors. Analytical accuracy is expressed as the percent recovery of an analyte that has been added to the sample (or standard matrix, i.e., blank) at a known concentration before analysis and is expressed by the following formula:

Accuracy = % Recovery =
$$\frac{A^{T} - A^{O}}{A^{F}} \times 100\%$$

Where:

 A^{T} = Total amount found in fortified sample.

A⁰ = Amount found in unfortified sample.

AF = Amount added to sample.

The fortified concentration may be specified as part of the project requirement or laboratory quality control requirements, (matrix spike). In the case of matrix spikes, the fortified concentration should be different enough (two to five times higher) from the background concentration to permit a reliable recovery calculation.

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Table 5-1
Target Compound List

	·			
Parameter	Methods	Extraction	Sejj (1997)/Se	Water mg/L
Arsenic	6010	3050	8.0	
	7060	3050	1.25	į
	6010	3010		0.08
	7060	3020		0.013
Barium	6010	3050	2.0	
	6010	3010	·	0.02
Cadmium	6010	3050	2.0	
	7131	3050	0.1	ĺ
	6010	3010		0.02
	7131	3020_		1.0
Chromium	6010	3050	4.0	
	7191	3050	0.83	}
	6010	3010		0.04
	7191	3020	*. 7.2	0.008
Lead	6010	3050	11.0	
· ·	7421	3050	0.78	
	6010	3010		0.11
	7421	3020		0.008
Selenium	6010	3050	15.0	•
	7740	3050	0.9	
	6010	3010		0.15
	7740	3020		0.009
Silver	6010	3050	3.0	
	7761	3050	0.44	
	6010	3010		0.03
	7761	3020		0.004
Mercury	7471	N/A	0.04	
	7470	N/A		0.002
Methyl Ethyl Ketone	8240	N/A	0.1	0.1
Trichlorofluoromethane		N/A	0.01	0.01
Vinyl Chloride		N/A	0.01	0.01
Toluene		N/A	0.005	0.005
Benzene		N/A	0.005	0.005
Acetone		Ñ/A	0.1	0.1
Bromodichloromethane		N/A	0.005	0.005
Bromoform		N/A	0.005	0.005
Chloroethane		N/A	0.01	0.01
Chloroform		N/A	0.005	0.005
Dibromochloromethane		N/A	0.005	0.005
1,1-Dichloroethane		N/A	0.005	0.005
1,2-Dichloroethane	.1.	N/A	0.005	0.005
trans 1,2-Dichloroethylene		N/A	0.005	0.005
1,2-Dichloropropane		N/A	0.005	0.005

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Table 5-1 (continued)

Target Compound List

Parameter	Method	Extraction	Soll my/Ko	Vejo UVL
cis-1,3-Dichloropropene		N/A	0.005	0.005
trans-1,3-Dichloropropene		N/A	0.005	0.005
Ethylbenzene		N/A	0.005	0.005
2-Hexanone		N/A	0.05	0.05
4-Methyl-2-pentanone		N/A	0.05	0.05
Styrene		N/A	0.005	0.005
1,1,2,2-Tetrachloroethane		N/A	0.005	0.005
1,1,2-Trichloroethane	·	N/A	0.005	0.005
Vinyl Acetate		N/A	0.05	0.05
Xylene (total)		N/A	0.005	0.005
Chloromethane		N/A	0.01	0.01
Bromomethane		N/A	0.01	0.01
Tetrachloroethene		N/A	0.005	0.005
Trichloroethene		N/A	0.005	0.005
Methylene Chloride	_	N/A	0.005	0.005
1,1,1-Trichloroethane	1	N/A	0.005	0.005
Carbon Disulfide		N/A	0.1	0.1
Carbon Tetrachloride		N/A	0.005	0.005
Chlorobenzene		N/A	0.005	0.005
1,1,2-Trichloro-1,2,2-Trifluoroethane		N/A	0.005	0.005
1,1-Dichloroethylene		N/A	0.005	0.005
cis-1,2-Dichloroethylene		N/A	0.005	0.005
Bis(2-ethylhexyl)phthalate	8270	3550	0.66	
	1	3510		0.01
4-Bromophenol phenyl Ether		3550	0.66	
		3510		0.01
Butyl benzyl phthalate		3550	0.66	
	1	3510		0.01
p-Chloroaniline	Ti and the second	3550	1.30	
	1	3510		0.02
p-Chloro-m-cresol		3550	0.66	
	İ	3510		0.01
2-Chloronaphthalene		3550	0.66	
	 	3510		0.01
2-Chlorophenol	1	3550	0.66	
•		3510		0.01
4-Chlorophenyl phenyl ether		3550	0.66	
• • • • • • • • • • • • • • • • • • • •	1	3510		0.01
Chrysene	1	3550	0.66	
(=		3510		0.01
Dibenz(a,h)anthracene		3550	0.66	
	1	3510	3.50	0.01
Dibenzofuran	1	3550	0.66	
		3510		0.01
			i	

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Table 5-1 (continued)

Target Compound List

		· · · · · · · · · · · · · · · · · · ·		
Parameter	Method	Extraction	Soji me/Ke	Water sing/L
3,3'-Dichloro-benzidine		3550	1.30	
. <u>.</u>		3510		0.02
Indeno(1,2,3-c,d)pyrene		3550	0.66	
		3510		0.01
Isophorone		3550	0.66	
		3510		0.01
2-Methylnaphthalene	·]	3550	0.66	
		3510	0.00	0.01
Naphthalene	·	3550	0.66	0.01
		3510	0.00	0.01
Di-n-butylphthalate		3550	0.66	0.01
0		3510 3550	1.30	0.01
2-methyl-4,6-dinitrophenol			1.30	0.02
o-Nitroaniline		3510 3550	3.30	0.02
0-Nitroaniiine		3510	3.30	0.05
m-Nitroaniline		3550	3.30	0.03
III-IVII Qaliiiile		3510	3.30	0.05
p-Nitroaniline	<u> </u>	3550	ND	0.00
p-Mucalimite		3510	.,,	0.02
Nitrobenzene		3550	0.66	0.02
THE OCCUPANT		3510	0.00	0.01
o-Nitrophenol		3550	0.66	
· · · · · · · · · · · · · · · · · · ·		3510		0.01
p-Nitrophenol		3550	3.30	
		3510		0.05
Pentachlorophenol		3550	3.30	
		3510		0.05
Phenanthrene		3550	0.66	
		3510_		0.01
Phenol		3550	0.66	
		3510		0.01
Pyrene	·	3550	0.66	
		3510		0.01
1,2,4-Trichlorobenzene		3550	0.66	
<u> </u>		3510		0.01
2,4,5-Trichlorophenol		3550	0.66	.
		3510	· · · · · · · · · · · · · · · · · · ·	0.01
2,4,6-Trichlorophenol		3550	0.66	
		3510		0.01
m-Dichlorobenzene		3550	0.66	
		3510	0.00	0.01
o-Dichlorobenzene		3550	0.66	000
		3510		0.01

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Table 5-1 (continued)

Target Compound List

Parameter	Method	Extracutor	Soil mg/Kg	Water mg/L
p-Dichlorobenzene		3550	0.66	************
p-Dichiorobenzene		3510	0.00	0.01
m-Cresol		3550	0.66	0.01
		3510	0.00	0.01
o-Cresol		3550	0.66	1 0.01
3.303.	ł	3510	""	0.01
p-Cresol		3550	0.33	
F		3510		0.005
Acenaphthene		3550	0.66	
•		3510		0.01
Acenaphthylene		3550	0.66	
		3510		0.01
Anthracene		3550	0.66	
<u> </u>		3510		0.01
Benzo(a)anthracene		3550	0.66	1
<u></u>		3510		0.01
Benzo(b)fluoranthene		3550	0.66	
		3510		0.01
Benzo(k)fluoranthene		3550	0.66	1
Daniel (ab. 2 and 1 and 1	- 	3510	0.00	0.01
Benzo(ghi)perylene		3550 3510	0.66	0.01
Benzo(a)pyrene	- -	3550	0.66	0.01
Delizo(a/pyrene:		3510	0.60	0.01
Benzyl alcohol		3550	1.30	0.01
Delizyi alconoi	İ	3510	1.50	0.02
Bis(2-chloroethyoxy)methane		3550	0.66	0.02
	ŀ	3510	0.55	0.01
Bis(2-chloroethyl)ether		3550	0.66	
Dist2-cinoroettiyi/ether		3510		0.01
2,4-Dichlorophenol		3550	0.66	
		3510		0.01
Diethyl phthalate		3550	0.66	
		3510		0.01
2,4-Dimethylphenol		3550	0.66	1
		3510		0.01
Dimethyl phthalate		3550	0.66	
		3510		0.01
2,4-Dinitrophenol		3550	3.3	
		3510		0.05
2,4-Dinitrotoluene	1	3550	0.66	
		3510	0.55	0.01
2,6-Dinitrotoluene	ŀ	3550	0.66	
		3510		0.01

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Table 5-1

Target Compound List

(continued)

			Soil	Water
Parameter	Method	Extraction	(i)://Ki	10,9/L
Di-n-octyl phthalate		3550	0.66	
		3510		_0.01
Fluoranthene		3550	0.66	
	ļ <u></u> _	3510		0.01
Fluorene		3550	0.66	
		3510		_0.01
Hexachlorobenzene		3550	0.66	
		3510		0.01
Hexachlorobutadiene		3550	0.66	
		3510		0.01
Hexachlorocyclopentadiene		3550	0.66	
_		3510		0.01
Hexachloroethane		3550	0.66	
		3510		0.01

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Table 5-2 **Summary of Precision and Accuracy Objectives**

Metals EPA Method 6010 and 7000 Series

		Precision (Felative %	Accuracy 196
Parameters***********************************	Matrix	Difference	Recovery
Arsenic	Soil	30	75 - 125
	Water	20	80 - 120
Barium	Soil	30	75 - 125
	Water	20	80 - 120
Cadmium	Soil	30	75 - 125
•	Water	20	80 - 120
Chromium	Soil	30	75 - 125
•	Water	20	80 - 120
Lead	Soil	30	75 - 125
•	Water	20	80 - 120
Selenium	Soil	30	75 - 125
· .	Water	20	80 - 120
Silver	Soil	30	75 - 125
	Water	20	80 - 120
Mercury	Soil	30	75 - 125
-	Water	20	80 - 120

Volatiles EPA Method 8240

Parameters	Matrix	Precision (Relative % Difference)	Accuracy (% Recovery)
Chlorobenzene	Soil	20	75 - 110
	Water	20	75 - 110
Toluene	Soil	20	76 - 125
- , -	Water	.20	76 - 125
Benzene	Soil	20	76 - 127
	Water	20	76 - 127
1,1-Dichloroethene	Soil	20	61 - 145
	Water	20	61 - 145
Trichloroethene	Soil	20	71 - 120
	Water	20	71 - 120

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Table 5-2 (continued)

Summary of Precision and Accuracy Objectives

Semi-Volatiles EPA Method 8270

		Pessin	
		Geanye %	Accuracy 1%
Parameters	Manx	Difference	Recovery
Phenol	Soil	35	26 - 115
	Water	42	12 - 110
2-Chlorophenol	Soil	50	25 - 115
•	Water	40	27 - 123
1,4-Dichlorobenzene	Soil	27	28 - 115
	Water	28	36 <u>-</u> 115
N-Nitroso-di-n-propylamine	Soil	38	41 - 126
	Water	_38	<u>41 - 116</u>
1,2,4-Trichlorobenzene	Soil	25	38 - 115
	Water	28	39 - 115
4-Chloro-3-methylphenol	Soil	33	26 - 115
	Water	42	23 - 115
Acenaphthene	Soil	25	31 - 137
·	Water	31	46 - 118
4-Nitrophenol	Soil	50	11 - 114
i	Water	50	10 - 115
2,4-Dinitrotoluene	Soil	47	28 - 115
	Water	38	24 - 115
Pentachlorophenol	Soil	47	17 - 115
•	Water	50	9 - 115
Pyrene	Soil	36	35 - 142
	Water	31	26 - 127

5.2 FIELD AND LABORATORY QUALITY CONTROL SAMPLES

Standard analytical quality control checks to be instituted by field and laboratory personnel include but are not limited to:

5.2.1 EQUIPMENT BLANKS

Samples are prepared using analyte-free water. Equipment blanks are routed through decontaminated sampling equipment prior to collection. Preservatives consider additives are added as required and the blank sample is then sealed. The equipment blank will then be shipped with real samples collected for the same parameter group. During field sampling an equipment blank will be collected and analyzed from each group of aqueous samples for each 10 samples received daily.

5.2.2 TRIP BLANKS

Volatile organic sample containers prepared in the laboratory using analyte-free water. The trip blanks accompany the field samples during transport to the site, during collection, packaging, and transport to the lab, during analysis, and will be contained in the same type of sample container as those used in the current sampling effort. One trip blank sample will be included for each cooler of aqueous VOA samples.

5.2.3 DUPLICATE SAMPLES

Samples collected from the same sampling location at the same time. At least one duplicate sample will be analyzed from each group of samples of a similar matrix type for every 10 samples received.

5.2.4 MATRIX SPIKE/MATRIX DUPLICATE (MS/MSD)

Samples in which compounds are added before extraction and analyses. The recoveries for spiked compounds can be used to assess how well the method used for analysis recovers target compounds (i.e., a measure of matrix interference in the sample). when reviewed in conjunction with other QC data, MS/MSD may indicate reanalysis using a more appropriate method. At least one spiked sample analysis will be performed on each group of samples of a similar matrix type and concentration for each batch of samples or for every 20 samples received, whichever is more frequent.

5.2.5 SURROGATE SPIKING

Samples in which surrogate compounds are added before sample preparation for organics. The review for spiked surrogate compounds can be used to assess method accuracy for each sample matrix.

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6.0 SAMPLING PROCEDURES

Refer to Section 6.0 of the main text of the Quality Assurance Project Plan.

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Table 6-1

Sample Containers, Preservation and Hold Times for Waters & Soils

<u> </u>								
(EP Rec.)	R TYPE (EP Rec.)	CONTAINE						
LIQUID: PRESERVATIVE FO	LIQUID	BOLID	HOLDINGTIME	SAMPLE: VOLUME	SAMPLE WEIGHT *	WATER/WASTEWATER METHOD **	SOLID WASTE METHOD *	PARAMETERS
mL HDPE pH < 2 HNO	500 mL HDPE	4 oz. CWM	6 months	200 mL	2 grems	200 Series/200.7	7000 Series/6010	Metals (Excluding Chromium VI & Hg)
Liters A.J. (1) Cool 4°C, .008%	2 1/2 Liters A.J.	8 oz. CWM	7 Days Ext./40 days after Ext.	1 Liter	30 grams	625, 1625	. 8270	Semi-Volatiles
(1) 4 Drops HCl, Cl L Glass Vial .008% Na2S2	40 mL Glass Vial	4.oz. CWM	14 Days	5 mL	5 grams	624, 1624	8204	Volatiles

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7.0 FIELD CUSTODY

Definition of custody - A sample is in one's custody if:

- It is in one's physical possession.
- It is in one's view, after being in one's physical possession.
- It is in one's physical possession and secured so that no one can tamper with it.
- It is kept in a secured area restricted to authorized personnel only.

7.1 CUSTODY PROCEDURES

All custody records should be originated by the supplier of sampling containers or by field personnel. The sample record contains the following information.

- Sample Identification
- Date and time of collection
- Source of the sample (include sample type and name of firm)
- Preservative
- Analysis requested
- Name of person collecting sample
- Any Special Information including potential level of contamination

The shipping container is sealed to prevent the sample tag from being removed and the container opened without authorization. The tags and seals should be filled out in legible handwriting.

When transferring the possession of samples, the transferee should sign and record the date and time the transfer took place.

The log-in personnel shall receive and verify the integrity of the samples. Samples not properly passed are not to be received until the client is notified of the specific problems and corrective action is specified. Photographs can be taken of damaged coolers and sample containers as evidence that samples were not received "in-tact".

7.2 LABORATORY CUSTODY PROCEDURES

Safety-Kleen's Environmental Laboratory assumes the responsibility for the integrity and security of the samples after proper custody transfer is completed.

- Safety-Kleen Technical Center's facility is securely locked 24 hours/day except the main entrance to the lab. The main entrance is locked from 7:00 pm to 6:00 am. The receptionists monitors the entrance of all visitors during 8:00 am to 5:00 pm. All nonemployed personnel sign an entrance logbook and then they are guided by facility personnel. The building has 24 hour security service.
- Log-in personnel, under supervision of the analytical project coordinator, receive the samples and provide a work order number for each sample received. Then they log samples into a bound sample log book by documenting appropriate information.

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 Log-in personnel coordinate sample bottle information, log book information, chain-of-custody records, and all pertinent information associated with the sample to assure that all information is correct.

- Persons designated by the analytical project coordinator or sample custodian are responsible for securing the samples in the appropriate storage areas within the secured laboratory facility.
 - All sample manipulation/preparation will be documented by the analyst/technician in the appropriate log i.e.) sample extraction log, sample digestion log, or sample distillation log.
- Internal chain-of-custody for samples is maintained by the Sample Custodian on the Sample Control Record Internal Chain-of-Custody. All samples and extracts must be signed for by the person from each lab retaining custody of these items. On completion of all analyses, these custody sheets will be placed in our data packet.
- All samples will be held until the results have been reported and accepted by the client, until
 litigation has been completed, or requested. All hazardous samples will be disposed of properly.
- When samples are transferred from the lab to any other destination chain-of-custody protocols are followed.

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			PROJECT # AUTHORIZATION #		
ENERATOR SITE & ADDRESS	JECT MANAGER(S)	PHONE & FAX			
AMPLER'S NAME	AND THE REPORT OF THE PROPERTY OF	ANALY	SIS REQUESTED	erico (S	
SAMPLE DE MATRIX SAMPLED CONTAINERS	PRESERVATION METHOD	ARIGE VOA BAZOO	FIGURE CARBONS GENTED Gas	PA 625/PPL CHEZYOTAL M88 (+ 25) C	
		 	 	 - - -	
		┤╸┤╸ ┤╾┤╾┼╾┼	╂═╂═╂═╂═╂═╂	╂╌╂╌┼╴	
		- - - - - -		╂═╂╼┼	
COMMENTS/REMARKS:			REQUESTED TAT		
The second secon	SAMPLE TRANSFER RE	ECORD			
RELINQUISHED BY			VED BY DAT		
SIGNATURE OF COLLECTOR:					
				 	
L					

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FIGURE 7-2

SAMPLE CONTROL RECORD INTERNAL CHAIN-OF-CUSTODY

Sample Custodian Signature:		Date/Time:		
Custody Seal:	present/absent intact/not intact	Samples Intact	Yes / No	
		Samples within Holding Times	Yes / No	
Chain-of-Custody:	present/absent	Samples Properly Preserved	Yes / No	
Work Order #:		Sample #:		

[
REFRIG	REMOVED BY	DATE/TIME REMOVED	CONTROL TO THE PROPERTY OF THE	DATETIMES RETURNED
	·			
	·		- · ·	
				·
	/			

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8.0 CALIBRATION PROCEDURES AND FREQUENCY

This section describes the basic protocols used for calibration of instruments used for AA metals, ICP metals, other inorganic parameters and organics. These protocols provide assurance of optimization of each procedure prior to the analysis of samples. Continuing calibration verification is also discussed in Section 11 "Internal Quality Control Checks".

Before an analytical method is performed, and annually there after, method detection level studies (MDLs) are performed. Method detection level studies are performed in accordance to the procedures described in the "Code of Federal Regulations, Section 40, part 136, Appendix B".

Instrument calibration typically consists of two types: initial calibration and continuing calibration. Initial calibration procedures establish the calibration range of the instrument and determine instrument response over that range. Typically, three to five analyte concentrations are used to establish instrument response over a concentration range. The instrument response over the range is generally absorbance, peak area, etc., which can be expressed as a linear model with a correlation coefficient (e.g. for Atomic Absorption, Inductively Coupled Plasma, UV-Visible-Infrared Spectrophotometry, Ion Chromatography) or as a response factor or amount vs response plot (e.g. for Gas Chromatography, Gas Chromatography).

Continuing calibration includes measurement of the instrument response to fewer calibration standards and requires instrument response to compare with certain limits (e.g. + 10%) of the initial measured instrument response. Continuing calibration may be used within an analytical sequence to verify stable calibration throughout the sequence, and/or to demonstrate that instrument response did not drift during a period of non-use.

Specific instrument calibration procedures for various instruments are detailed further in this section and in the laboratories standard operating procedures.

8.1 METALS

The H.C. lamp and flame position are adjusted for maximum optimization. A standard calibration curve consisting of a calibration blank and three standards are analyzed and absorbance readings are recorded. An initial calibration verification sample will be analyzed and be within 90 - 110% of the true value. (Mercury range is 80 - 120%.) A continuing calibration standard will be analyzed every ten samples to verify the continual instrument optimization.

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If the standard does not fall within 10% of original curve, the instrument will be recalibrated and the samples in the previous set reanalyzed.

An initial calibration verification (ICV) is performed at the beginning of the analysis of samples by analyzing an independent standard. The ICV must be 90 - 110% recovery of the known concentration. The ICV is an independently prepared standard from an alternate source from the Calibration standards. It is analyzed at a concentration at the midrange of the calibration curve.

A continuing calibration verification (CCV) sample is analyzed every ten samples during an analytical run. The CCV must be 90 - 110% recovery of the known concentration. The CCV is an independently prepared standard from an alternate source from the Calibration standards.

8.2 ICP METALS

Calibration using a calibration blank and three standards is performed after a period of time sufficient to warm up the instrument. The standard curve must show a correlation coefficient of 0.995 - 1.000. All samples above the ICP linear range are diluted and analyzed.

ICP Interference Check Sample: Certified ICP Interference Check Sample is obtained for outside sources. Control limit is $\pm 20\%$ of the true value for analytes included in the ICS. If results for the check sample do not fall within the control limit, terminate the analysis, correct the problem, recalibrate, reverify the calibration, and reanalyze the samples.

8.3 INORGANIC COLORIMETRIC METHODS

Standard calibration curves are prepared for all analyses on a daily basis or a standard curve is analyzed whenever new reagents are used, or when changes in the procedure are introduced. For each batch of analyses a midrange and high range standard will be analyzed and must be within 10% of the original curve. If it is not within 10% of the original curve, a new curve will be developed or reanalysis of the standards will be done to verify they do not fit the curve. The standard curve is composed of a reagent blank, three to five standards and must have a correlation coefficient of 0.995 - 1.000.

For procedures that require pretreatment steps, a minimum of one standard shall be prepared with the pretreatment. If the pretreated standard is within 20% of the standard curve the curve will be used. If the pretreated sample is not within 20% of the curve the reason will be determined. If it is determined that the difference between the curves is inherent in the procedure, the curve will be based on the standards prepared and carried through the pretreatment.

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8.4 VOLATILE ORGANICS AND ACID BASE/NEUTRALS BY GC/MS

Initial demonstration of acceptable precision and accuracy will be accomplished by analyzing three replicate spiked samples according to the applicable waste water method. The average concentration and standard deviation for each component must meet quality control acceptance criteria in the applicable waste water method. Alternatively, historical data generated with USEPA CLP protocols may be submitted. Data from spiked blanks, USEPA quality control samples, or USEPA performance evaluation samples is acceptable.

When using capillary columns, the Environmental Laboratory obtains less than 6% relative standard deviation (RSD) between replicate injections and less than 15% RSD between replicate purge for each instrument. RSD of surrogate response, calculate I by internal standard technique, is measured in blank samples or standards.

Initial calibration curves are generated for each compound on the attached target lists for the method being calibrated. The standards used to generate the curves must start at or near the Practical Quantitation Limit (PQL) and cover the entire working range of the instrument. Any sample concentrate must be diluted so that all components present above the contract required detection level fall within the range of the initial calibration curve. When dilution of a sample or sample extract is necessary, the analyst will quantify the lower level components from the initial undiluted analysis.

For GC/MS analyses, calibration is performed on five points by the internal standard technique. Calculate Response Factors (RF) according to:

RF = Ax/Ais X Cis/Cx

Ax = Area of the characteristic ion of compound to be measured

Ais = Area of the characteristic ion of the specific internal standard used to calculate the compound to be measured.

Cis = Concentration of the internal standard (ng/ μ L).

 $Cx = Concentration of the compound to be measured (ng/<math>\mu$ L).

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Response factor and average response factor must be calculated for each component.

The minimum acceptable average RF for the volatile compounds; chloromethane, 1,1-dichloroethane, 1,1,2,2-tetrachloroethane and chlorobenzene is 0.300.

The minimum acceptable average RF for bromoform is 0.250.

The minimum acceptable average RF for the semivolatile compounds; N-nitroso-di-n-propylamine, hexachlorocyclopentadiene, 2,4-dinitrophenol and 4-nitrophenol is 0.050.

The Percent Relative Standard Deviation (% RSD) must be calculated for all target compounds.

For the following Calibration Check Compounds (CCC), (% RSD) critera apply:

Base / Neutral CCC	Acid / CCC	Volatile / CCC
Acenaphthene	4-Chloro-3-Methylphenol	1,1-Dichloroethene
1,4-Dichlorobenzene	2,4-Dichlorophenol	Chloroform
Hexachlorobutadiene	2-Nitrophenol	1,2-Dichloropropane
N-Nitrosodiphenylamine	Phenol	Toluene
Di-n-Octylphthalate	Pentachlorophenol	Ethylbenzene
Fluoranthene	2,4,6-Trichlorophenol	Vinyl Chloride
Benzo(a)pyrene	,,	•

Calculate percent RSD by: % RSD = (SD / average RF) x 100

SD = Standard Deviation of initial 5 response factors (per compound)

For the initial calibration to be valid, the percent RSD for these compounds must be less than 30%.

For each 12-hour period, before any samples or standards are run on the GC/MS, the tuning must be verified by comparing the spectrum of BFB (p-bromo-fluorobenzene) for volatile analysis or DFTPP (decafluoro-triphenylphosphine) for base/neutral or acid extractable (BNA) analysis to the ion abundance criteria in Table 8.1 or (BFB) or Table 8.2 (DFTPP). For each tuning verification compound, the mass labeled as the base peak in the appropriate table must be 100% relative abundance.

Elution of the sample component will be at the same GC relative retention time (RRT) as the standard of that component. For establishing correspondence of the RRT, the sample component RRT must compare within ± 0.06 RRT units of the RRT of the standard component. For reference, the standard must be run within 12 hours of the sample. If coelution of interfering components prohibits accurate assignment of the sample component RRT from the total ion chromatogram, the RRT should be assigned by using extracted ion current profiles for ions unique to the component of interest.

Correspondence of the sample component mass spectrum and the standard component mass spectrum must be established. For comparison of standard and sample component mass spectra, mass spectra obtained on the GC/MS are required. Once obtained, these standard spectra may be used only if the GC/MS meets the daily tuning requirements for the analysis being performed. The standard spectra may be obtained from the run used to obtain reference RRTs. All ions present in the standard mass spectrum at a relative intensity greater than 10% must be present in the sample spectrum and their relative intensities must agree within \pm 20%. Ions present in the sample spectrum, at greater than 10% relative abundance, which are not present in the standard spectrum must be considered and accounted for by the analyst.

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8.5 STANDARDS SOURCES, TRACEABILITY AND DOCUMENTATION

Standard solutions used to prepare standard curves, matrix spikes, or quality control check solutions are traceable to one of the following: 1) A certified compound and supplier lot # 2) An EPA reference standard 3) NITS (National Institute of Technology and Standards formerly the National Bureau of Standards). Log books are used for standards traceability.

Each section in the laboratory has their own source of standard reference materials and tracking and documentation systems. Although the sections will be slightly different from each other, the basic essential elements exist, including:

• On receipt, each standard is recorded in a bound log book. The manufacturer, lot #, date received, expiration date and the initials of the recording analyst are documented in the log book.

All information tracking the traceability for standards is recorded, including the preparation of standard solutions, spike solutions, and all other reference sources used in routine analytical procedures.

The documentation of traceability is recorded in the analysts notebook or lab data so that each analytical result can be linked to the appropriate reference material.

The sources, preparation and storage of standards is specified in each analytical procedure.

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Table 8-1
Bromofluorobenzene
(BFB) Tuning Verification Limits

Mass	Ion Abundance Criteria
50	15.0 - 40.0% of the base peak
75	30.0 - 60.0% of the base peak
95	Base peak, 100% relative abundance
96	5.0 - 9.0% of the base peak
173	Less than 2.0% of the base peak
174	Greater than 50.0% of the base peak
175	5.0 - 9.0% of mass 174
176	Greater than 95.0% but less than 101.0% of mass 174
177	5.0 - 9.0% of mass 176

Table 8-2
Decafluorotriphenylphosphine
(DFTPP) Tuning Verification Limits

Mass	Ion Abundance Criteria
51	30.0 - 60.0% of mass 198
68	Less than 2.0% of mass 69
70	Less than 2.0% of mass 69
127	40.0 - 60.0% of mass 198
197	Less than 1.0% of mass 198
198	Base peak, 100% relative abundance
199	5.0 - 9.0% of mass 198
275	10.0 - 30.0% of mass 198
365	Greater than 1.0% of mass 198
441	Present but less than mass 443
442	Greater than 40.0% of mass 198
443	17.0 - 23.0% of mass 442

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9.0 ANALYTICAL PROCEDURES

Analytical services can be provided for additional parameters not targeted in this plan. Since numerous methods and analytical techniques are available, continued communication between the client and laboratory is imperative to assure the correct methods are utilized.

Additional methodology used by Safety-Kleen's Environmental Laboratory are as follows:

- ♦ American Public Health Association, <u>Standard Methods for the Examination of Water and Wastewater</u>, 18th ed., Washington D.C.: American Public Health Association, 1992.
- Environmental Protection Agency. Environmental Monitoring and Support Laboratory. Office of Research and Development. <u>Methods for Chemical Analysis of Water and Wastes</u>. Cincinnati: U.S. Environmental Protection Agency. Environmental Monitoring and Support Laboratory. Office of Research and Development, 1983.
- ♦ Environmental Protection Agency. Office of Solid Waste and Emergency Response. <u>Test Methods for Evaluating Solid Waste. Physical/Chemical Methods (SW-846)</u>. 3rd ed. 4 vols. Washington, D.C.: U.S. Government Printing Office, 1986.

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10.0 DATA REDUCTION, VALIDATION AND REPORTING

10.1 FIELD AND TECHNICAL DATA

The field and technical (non-laboratory) data that will be collected can generally be characterized as either "objective" or "subjective" data.

Objective data include all direct measurements of field data, such as field screening/analytical parameters and water level measurements. Subjective data include descriptions and observations. Soil borings and well logs include both subjective and objective data in that the data recorded in the field are descriptive but can be reduced using a standardized lithologic coding system.

All data collection activities performed at a site will be documented either in a field log or on appropriate forms. Entries will be as detailed and descriptive as possible so that a particular situation can be recalled without reliance on the collector's memory. All field log entries will be dated. Field notebooks will be bound books and will be assigned to individual field personnel for the duration of their stay in the field. All field log forms will be kept in ring binders assigned to individual field personnel.

The cover of each log or ring binder will contain the following information:

- ♦ Person to whom the book is assigned
- ♦ Project name
- ♦ Start date
- ♦ End date

10.1.1 DATA REDUCTION

As described in Subsection 10.1, all field data will be recorded by field personnel in bound field logs and on the appropriate forms in ring binders. For example, during drilling activities, the field team member supervising a rig will keep a chronological log of drilling activities, a descriptive log of lithologies encountered, other pertinent drilling information (staining, odors, field screening, atmospheric measurements, water levels, geotechnical data). Upon completion of each test boring or monitor well, a form will be completed that will include lithologic codes along with descriptive data.

After checking the data in the field notes and forms (see Subsection 10.1.2), the Field Team Leader will reduce the data to tabular form, wherever possible, by entering it in data files. Where appropriate, the data files will be set up for direct input into a database. For example, the form for a test boring or well log will be checked against the field notes and then key punched directly to the database. Other objective data may be set up in spreadsheet-type tabular files (e.g., water level data). Subjective data will be filed as hard copies for later review by the Technical Leader and for incorporation into technical reports, as appropriate.

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10.1.2 DATA VALIDATION

Validation of objective field and technical data will be performed at the Field Team Leader level. The team leader makes all data entries into the field notebook. After data reduction into tables or arrays, the Field Team Leader will make a second review of the data sets for anomalous values. Any inconsistencies or anomalies discovered will be resolved immediately. The completion and verification of paperwork and reports is the responsibility of the team leader.

Subjective field and technical data will be validated by the Project Manager, who will review field reports for reasonableness and completeness. In addition, random checks of sampling and field conditions will be made by the Field Supervisor, who will check recorded data at that time to confirm the recorded observations. Whenever possible peer review will also be incorporated into the data validation process, particularly for subjective data, in order to maximize consistency between field personnel.

10.2 LABORATORY DATA INTERNAL PROCEDURES

10.2.1 DATA LOGGING

The sample custodian, upon receipt of samples for analysis accompanied by a completed request for analysis and/or Chain-of-Custody form, will do the following:

- ♦ Verify completeness of submitted documents, including the Chain-of-Custody forms.
- ♦ Log-in samples, assign unique work order numbers, and attach the numbers to the sample container(s).
- ♦ Open the project file and enter data on the laboratory computer.
- ♦ Store samples in refrigerated sample bank.

10.2.2 DATA COLLECTION

In addition to the data collected in the field and recorded on the Chain-of-Custody forms, data describing the processing of samples will be accumulated in the laboratory and recorded. Laboratory QA folders will contain the following:

- ♦ Date of processing
- ♦ Sample numbers
- ♦ Client (optional)
- ♦ Analyses or operation performed
- ♦ Calibration data
- ♦ Quality control samples included
- Concentrations/dilutions required
- Instrument readings
- Special observations (optional)
- ♦ Analyst's signature

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10.2.3 DATA REDUCTION

Data reduction is performed by the individual analysts and consists of calculating concentrations in samples from the raw data obtained from the measuring instruments. The complexity of the data reduction will be dependent on the specific analytical method and the number of discrete operations (extractions, dilutions, and concentrations) involved in obtaining a sample that can be measured.

For those methods using a calibration curve, sample response will be applied to the linear regression line to obtain an initial raw result, which is then factored into equations to obtain the estimate of the concentration in the original sample. Rounding will not be performed until after the final result is obtained to minimize rounding errors, and results will not normally be expressed in more than two significant figures.

Copies of all raw data and the calculations used to generate the final results will be retained on file to allow reconstruction of the data reduction process at a later date.

10.2.4 DATA REVIEW/VALIDATION

System reviews are performed at all levels. The individual analyst constantly reviews the quality of data through calibration checks, quality control sample results, and performance evaluation samples. These reviews are performed prior to submission to the Group Leaders or the Analytical Project Coordinator.

The Group Leaders and/or the Analytical Project Coordinator review data for the consistency and reasonableness with other generated data and determine if program requirements have been satisfied. Selected hard copy output of data (chromatograms, spectra, etc.) will be reviewed to ensure that results are interpreted correctly. Unusual or unexpected results will be reviewed, and a resolution will be made as to whether the analysis should be repeated.

The final routine review is performed by the Laboratory Manager prior to reporting the results to the client. Non-routine audits are performed by regulatory agencies and client representatives. The level of detail and the areas of concern during these reviews are dependent on the specific program requirements.

10.2.5 DATA REPORTING

Reports will contain final results (uncorrected for blanks and recoveries), methods of analysis, levels of detection, surrogate recovery data, and method blank data. In addition, special analytical problems and/or any modifications of referenced methods will be noted. The number of significant figures reported will be consistent with the limits of uncertainty inherent in the analytical method. Consequently, most analytical results will be reported to no more than two (2) significant figures. Data are normally reported in units commonly used for the analyses performed. Concentrations in liquids are expressed in terms of weight per unit volume (e.g., milligrams per liter). Concentrations in solid or semisolid matrices are expressed in terms of weight per unit weight of sample (e.g., micrograms per gram).

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Reported detection limits will be the concentration in the original matrix corresponding to the low level instrument calibration standard after concentration, dilution, and/or extraction factors are accounted for, unless otherwise specified by program requirements.

The final data report provided by the laboratory will be a Standard Client Report. This report contains a transmittal letter and the following information:

Inorganics

- ♦ Cover letter with Laboratory Manager sign-off
- ♦ Data Qualifiers
- ♦ Chain-of-Custody
- ♦ Lab Chronicle describing: Client ID/Analysis, Matrix, Preparation #, Collection Date, Extraction/Preparation Date, Analysis Date, and Group Leader sign-off
- ♦ Case narrative if any technical problems occurred
- ♦ Client Data Report
- Quality Control Summary Reports: Method Blank Data Report and Laboratory Control Standards Report (LCS)

Note: MS/MSD may be performed on other clients samples within the analytical batch.

Organics (GC/MS)

- ♦ Cover letter with Laboratory Manager sign-off
- **♦** Data Qualifiers
- ♦ Chain-of-Custody
- ♦ Lab Chronicle describing: Client ID/Analysis, Preparation #, Collection Date, Extraction/Preparation Date, Analysis Date, and Group Leader sign-off
- ♦ Case narrative if any technical problems occurred
- ♦ Sample Data Report
- ♦ Quality Control Summary Report (spreadsheet)
- ♦ Raw data package for GC/MS Volatiles and Semivolatiles

Note: MS/MSD may be performed on other clients samples within the analytical batch.

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10.2.6 LABORATORY DATA ARCHIVING

The laboratories will maintain on file all of the raw data, laboratory notebooks, and other documentation pertinent to the work on a given project. This file will be maintained by the laboratory.

Data retrieval from archives will be handled in a similar fashion as a request for analysis. Specifically, a written work request to include a quotation must be submitted for retrieval of data. Client confidentiality will be maintained with retrieved data. Consequently, the laboratory can honor only those requests for data authorized by the original client.

10.3 DATA VALIDATION/USABILITY REVIEW

Separate from the laboratory's internal data review/data validation, a review of the final data package will be performed to validate results and to determine usability. Criteria to assess usability will be taken from U.S. EPA's Functional Guidelines on Data Validation. The depth of review will depend on the data deliverable package. Guideline criteria will be applied to available documentation. For example, in a Level II package, since standards data are not submitted, sections of the guidelines applicable to review of standards will not be done. However, blank data, surrogate and MS/MSD recovery, and sample chromatograms will be reviewed in light of the guidelines.

10.4 VALIDATING ANALYTICAL PERFORMANCE

All raw data will be examined by the analyst to verify that the documentation is correct. Control charts or tables are used by the analyst to evaluate the daily analytical performance and to determine that valid data was generated. It is the analyst's responsibility to confirm that the goals for precision and accuracy on duplicates, spiked samples and reference samples are met using the proper control charts or tables.

The Quality Assurance/Quality Control personnel's responsibility is to review the control charts to assure that deviations from acceptance criteria is noted and audits are performed quarterly to assure raw data meets criteria.

10.5 VERIFICATION OF DATA

Analytical data is verified in a three step review process. Initially the analyst reviews the analytical raw data prior to the reporting of results. Precision and accuracy of results are checked to verify they meet quality assurance/quality control limits. If results are not within quality assurance/quality control objectives corrective action is taken. A corrective action report (C.A.R.) is filled out. The deviations and the correction action taken are documented on the C.A.R. form.

Prior to shipping an analytical report the data package is reviewed by the laboratory group leaders and project coordinator. The group leaders and project coordinator verify the package is complete and deviations in protocols are accounted for.

The Laboratory Manager verifies the final report is printed correctly and completely.

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10.6 RAW DATA REPORTING

Final results of samples are reported through the Laboratory Information Management System (LIMS). LIMS is used for data review, data reporting, and archiving. The Laboratory Manager, group leaders, and project management personnel review and sign all data packages before they are sent to the client. The sample reports are then filed by work order number in a secured area for future reference and kept on file per Safety-Kleen's Record Retention Policy.

11.0 INTERNAL QUALITY CONTROL CHECKS

The Quality Control department systematically checks control charts to assure the precision and accuracy of all methods meet the objectives listed in Section 5. Our quality control program provides confidence in the accuracy of analytical results and provides information to detect determinant sources of error. Precision is monitored and controlled by replicate analyses. Precision can be estimated by statistical techniques (listed in Section 14) and can control indeterminate errors inherent in a procedure.

11.1 QUALITY CONTROL INORGANICS

The minimum QC requirements of the inorganic program consist of both an initial and ongoing demonstration the Laboratories capability to generate acceptable precision and accuracy, using approved methods in the analysis of samples from various matrices. If any QC measurement fails to meet criteria the analytical measurement may be repeated only once prior to taking the appropriate corrective action. These include, but are not limited to, the following:

- ♦ Calibration Curve and Initial Calibration Verification
- ♦ Calibration Blank
- ♦ Continuing Calibration Verification
- ♦ ICP Interference Check Sample analysis
- ♦ Preparation Blank analysis
- ♦ Sample Spike analysis
- ♦ Spike Duplicate analysis
- ♦ Laboratory Control Sample analysis

11.2 METALS QC

11.2.1 CALIBRATION CURVE

For atomic absorption systems & ICP, calibration curves are composed of a minimum of a calibration blank and three standards. The calibration curve is prepared fresh each time an analysis is to be performed. If the AA instrument configuration prevents the required 4-point calibration, we calibrate according to instrument manufacturer's recommendations, and analyze the remaining required standards. The Method of Standard Addition (MSA) is used for samples that suffer from matrix interferences.

11.2.2 INITIAL CALIBRATION VERIFICATION

Initial calibration verification for metals is performed at the beginning of the analysis of samples by analyzing an independent standard. The independent standard is prepared from a different stock standard source than that used in the preparation of standards for the calibration curve. The independent standard concentration must fall within the calibration range.

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11.2.3 CALIBRATION BLANK

A calibration blank is analyzed each time the instrument is calibrated, at the beginning of the run, and once every 10 analytical samples during the run.

11.2.4 CONTINUING CALIBRATION VERIFICATION

These checks determine that the analytical system is meeting QC criteria specified in SW-846 6000/7000. A midrange standard is analyzed every 10 analytical samples. The standard is also analyzed for each analyte after the last analytical sample. The standard is prepared from a different stock standard source than that used in the preparation of standards for the calibration curve.

11.2.5 ICP INTERFERENCE CHECK SAMPLE

ICP interference check sample analyses must be performed at the beginning and end of each sample analysis run (or a minimum of twice per eight-hour shift) to verify interelemental and background correction factors.

11.2.6 PREPARATION BLANK

Preparation blank analyses must be performed for each batch of samples, or for each set of 20 samples, to ascertain whether sample concentrations reflect contamination.

11.2.7 SAMPLE SPIKES

Spiked sample analyses must be performed for each matrix within a batch of samples or for each set of 20 samples of a similar matrix within a batch. This provides information on analytical accuracy, and the effect of the sample matrix on the digestion and measurement methodology.

11.2.8 SAMPLE SPIKE DUPLICATES

Duplicate spikes must be performed for each set of 20 samples. This provides information concerning analytical precision.

11.2.9 LABORATORY CONTROL STANDARD

The "laboratory control standard" is a standard carried through sample preparation and analytical methods to document the performance of the entire sample process. The laboratory control sample is analyzed for each batch of samples taken through the sample process or for each set of 20 samples. The LCS is used to control method accuracy results for metals. The control samples are blanks spiked with the appropriate concentration of metals to be determined so that at the time of analysis the final concentration should fall on the calibration curve. Percent recovery is then determined.

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11.3 OTHER INORGANIC PARAMETERS

For all other inorganic parameters the frequency of QC stated below is required.

11.3.1 PREPARATION BLANK

Every 20 samples if distillation or digestion is required by the analytical method.

11.3.2 SAMPLE DUPLICATE

Every 20 samples.

11.3.3 SAMPLE SPIKE

Every 20 samples.

11.3.4 LABORATORY CONTROL SAMPLE

Every 20 samples. If the method calls for sample preparation (i.e., Distillation, Digestion, etc.), the lab control sample shall be subject to the entire procedure. The laboratory control sample is being used to validate the calibration curve and determine the level of analytical accuracy.

11.4 ORGANICS QC

In order to monitor method precision and accuracy, duplicate matrix spikes will be analyzed every 20 samples, or once per batch of samples of a similar matrix, for each method. Matrix spike compounds for each type of analysis and limits for percent recovery and relative percent difference, are given in Table 5.6.

Reagent water blanks, field blanks, and equipment blanks are analyzed to monitor sample integrity. Surrogate spike compounds are added to every sample to monitor method quality control. A reagent water blank will be analyzed every day that semivolatiles are extracted. A reagent water blank will be analyzed each day before volatile analysis is performed.

11.5 LIMITS FOR CONTAMINANTS IN BLANKS

11.5.1 BNA AND VOA

Any compound, except common phthalate esters, on the attached target compounds list present in a blank must be below the Practical Quantitation Limit (PQL). Common phthalate esters must be below five times the PQL.

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All contaminants except the common laboratory solvents, methylene chloride, acetone and toluene, in the daily reagent water blank must be below the PQL before analysis of samples may proceed. Target compounds, except common laboratory solvents, in the field blank must be below the PQL. Common laboratory solvents in the field blank must be below five times PQL.

If the limits for contaminants are exceeded in a blank and any of the associated samples contain that compound at reportable levels, corrective action must be taken and documented. The samples associated with the suspect blank must be reanalyzed if sufficient sample volume is available. If sufficient sample volume is not available, the problem and corrective actions taken must be discussed in the Quality Assurance summary narrative.

Surrogate spike compounds will be added to each sample analyzed for acid and base/neutral extractables and volatile organics.

If any surrogate compound recovery in a volatile (VOA) or any two base-neutral/acid (BNA) surrogates in the reagent water blank is outside the above criteria, the source of the error will be determined and corrected. The reagent water blank and all associated samples will be reanalyzed.

If any VOA surrogate compound is outside the above criteria the sample will be reanalyzed. If any 2 BNA surrogate compounds are outside the above criteria for any sample, the sample will be reanalyzed. If the percent recovery of any one surrogate in a BNA sample is below ten percent the sample will be reanalyzed. If the reanalyzed sample is also outside the limits, then both results will be reported and the situation will be documented in a case narrative provided to the client. If the reanalysis is within the limits, then the results of the reanalysis only are reported to the client. When the surrogate recoveries are outside the limits for a matrix spike and matrix spike duplicate they will not be reanalyzed, however, the similarity in poor recoveries will be documented in the case narrative reported to the client.

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12.0 INTERNAL PERFORMANCE AND SYSTEM AUDITS

All quality control results are reviewed by the analyst and group leaders before reports are released to report generation. Quarterly evaluations of all quality control data are reviewed by the quality control personnel to examine long term trends in the quality control data such as continual low recoveries with a certain procedure.

Routine system audits are performed to check for compliance with provisions set forth in this QAP. This includes checking analyst's lab books and raw analytical data. Corrective actions are taken to alleviate problem situations identified during the audit. This continued evaluation ensures the production of high quality data.

At a minimum, quarterly external reference samples are used to provide performance evaluation of wet chemical analyses, metals and organic analyses. The results of the reference sample are used to evaluate the accuracy of the procedures and to assure the quality control objectives are met.

12.1 RAW DATA AUDIT

All lab notebooks are issued a sequential number to assure document control. Each time a new notebook is issued it is assigned a number and the information is recorded in a reference book. The date issued, date completed, analyst's name, and/or the description of the lab book will be noted in the reference.

In developing a working data validation system, all active laboratory lab books and quality control files are subject to periodic audits. The evaluation will be based on the following:

Information

The following information should be present when applicable. The parameter tested, method used, instrument used, date of analysis, analyst signature, wavelength, filter setting, cell path length, and all other pertinent data that validates the analytical results.

Standard Evaluation

A blank and three to five levels of standards shall be used. The unit of measure of the standards should be shown. All samples must fall within the working range of the standards. The percent goodness of fit or correlation coefficient, and any other such data showing the linearity of the standard curve should be recorded. Correlation coefficient of standard curves must be between 0.995 and 1.00.

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Quality Control Evaluation

All quality assurance/quality control data with the amount spiked, percent recovery and all calculation, etc. must be reported in lab books. Duplicates, method blanks, matrix spikes, spike blanks, known quality control should be present at a specified frequency. The quality control data should also be reported on a DAILY basis.

Neatness and Ease of Data Interpretation

A good format should be used and should be kept neat. No scratching out, no soluble marker, no pencil, and no "white out" should appear. All unused portions of the page are to be "Z'd" out and the page signed by the analyst after the data has been reviewed.

12.2 EXTERNAL PERFORMANCE AND SYSTEMS AUDITS

As part of Safety-Kleen's effort to assure project compliance is satisfied, on -site systems audits by the client or regulatory agencies are permitted. Full cooperation by Safety-Kleen's staff will be provided. A response to all deficiencies determined during the on-site will be addressed within a timely manner.

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13.0 PREVENTIVE MAINTENANCE

Maintenance of equipment is an important part of every laboratory operation. The responsibility of routine care lies with the analysts using the instruments. Every manufacturer furnishes an instrument maintenance manual. These are kept on file for reference. Each instrument has a logbook in which daily preventive maintenance is recorded. Repairs that can not be performed by laboratory staff are contracted to the manufacturer's service department or under maintenance agreements. All laboratory balances are checked annually under service contracts.

The elements of the maintenance program are discussed in the following sections. Table 13-1 is a synopsis of the minimum equipment checks and a calendar of equipment maintenance schedule.

13.1 INSTRUMENT MAINTENANCE LOG BOOKS

Each analytical instrument is assigned a instrument log book. All maintenance activities are recorded in the instrument log. The information entered in the instrument log includes:

- date of service or maintenance,
- · person performing service or maintenance,
- type of service performed and reason for service,
- replacement parts installed (if appropriate), and
- · miscellaneous information.

If service is performed by the manufacturer, a copy of the service record is filed.

13.2 SPARE PARTS

The Environmental Laboratory maintains an inventory of routinely required spare parts (for example, spare sources, vacuum pumps and filaments for GC/MS, spare torches, burner heads for AA-ICP). The instrument operators have the responsibility, with the appropriate Group Leader, to ensure that an acceptable inventory of spare parts is maintained.

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Table 13-1 Calendar of Equipment Maintenance

<u>.</u>		
Parameter	Procedure	Frequency
Gas Chromatograph	Check response with standard mixture, compare to previous day and file chromatograph.	Daily
	Check temperature of detector, inlet, column oven and document in instrument log.	Daily
	Verify linearity.	Daily
	Septum replacement.	Daily
	Evaluate performance of each column with special standard mixture.	Monthly
	Column Temperature verification.	Monthly
	Pump oil-level check.	Monthly
W 1 D 1 100040	Pump oil changing.	Semi-annually
Hewlett Packard GC/MS	Mechanical pump turbo.	Semi-annually or when bakeout does not adequately reduce background.
GC/MS	Analyzer cleaning.	Dirty or contaminated analyzer components may also produce poor peak shape and require excessive ion energy to obtain reasonable sensitivity.

Table 13-1 (continued)

Calendar of Equipment Maintenance

·		
Procedure	Frequency	
Check condition of pump winding.	Daily	
Check liquid argon supply.	Weekly	
Check condition of torch.	Weekly	
Check sample spray chamber for debris.	As required	
Clean and align nebulizer	As required	
Clean or replace air filters.	Monthly	
Replace vacuum pump oil.	Quarterly	
Clean windows and graphite electrodes.	Daily	•
Prime autosampler syringe and clean sample tip.	Daily	·
Check graphite tube and replace if necessary.	Daily	
Replace graphite electrode.	As required	
Replace autosampler syringe.	As required	
Replace lamp.	As required	
	Check condition of pump winding. Check liquid argon supply. Check condition of torch. Check sample spray chamber for debris. Clean and align nebulizer Clean or replace air filters. Replace vacuum pump oil. Clean windows and graphite electrodes. Prime autosampler syringe and clean sample tip. Check graphite tube and replace if necessary. Replace graphite electrode. Replace autosampler syringe.	Check condition of pump winding. Check liquid argon supply. Check condition of torch. Check sample spray chamber for debris. Clean and align nebulizer Clean or replace air filters. Monthly Replace vacuum pump oil. Clean windows and graphite electrodes. Prime autosampler syringe and clean sample tip. Check graphite tube and replace if necessary. Replace graphite electrode. As required As required As required As required

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14.0 QUALITY CONTROL DATA ASSESSMENT

14.1 FREQUENCY OF INTERNAL QUALITY CONTROL CHECKS

The frequency of quality checks is based on the type of analysis. Regularly scheduled analysis of known duplicates, standards, and spiked samples are a routine aspect of the data reduction, validation, and reporting procedures. Specific frequency criteria for the internal quality assurance checks cited below are presented in the SOPs for various method:

14.1.1 GAS CHROMATOGRAPH/MASS SPECTROSCO. Y (GC/MS) METHOD PERFORMANCE DOCUMENTATION

During each operating shift, a midpoint calibration standard is analyzed to verify that the instrument responses are still within the initial calibration determinations. The calibration check compounds will be those analytes specified in SW-846 methods.

The response factor drift (percent D, i.e., percent difference compared to the average response factor from the initial calibration) will be calculated and recorded. If significant (>20 percent) response factor drift is observed, appropriate corrective actions will be taken to restore confidence in the instrumental measurements.

All GC/MS analyses will include analysis of a method blank, a matrix spike, and a matrix spike duplicate in each lot of twenty (20) or fewer samples. Matrix spike solutions containing components of interest will be used for both matrix spikes and blank spikes. In addition, appropriate surrogate compounds specified in EPA SW-846 methods will be spiked into each sample. Recovery criteria for surrogate compounds will be evaluated as specified in the SOPs.

14.1.2 GC/MS DETECTION LIMITS

The PQLs as prescribed by SW-846 Chapter One are used for reporting GC/MS data. These detection limits are compared with laboratory-determined instrument detection limits to ensure that the reported values are attainable. Instrument detection limits are determined from seven replicate analyses of target compounds measured at three to five times the MDL. The calculated instrument detection limit is the standard deviation of the measured values times the students test value.

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14.2 INORGANIC - INDUCTIVELY COUPLED PLASMA SPECTROSCOPY (ICP) & ATOMIC ABSORPTION (AA)

14.2.1 ICP AND AA QUALITY CONTROL

At least one method blank and one method blank spike (Laboratory Control Sample (LCS)) will be included in each batch of samples. Regardless of the matrix being processed, the LCSs and blanks will be in aqueous media.

The method blanks will be examined to determine if contamination is being introduced in the laboratory.

The LCS results will be examined to determine accuracy. Accuracy will be measured by the percent recovery (percent R) of the spikes. The recovery must be within the range of 80 to 120 percent to be considered acceptable.

Sample spike results will be examined to determine both precision and accuracy. Accuracy will be measured by the percent recovery of the spikes. Precision will be measured by percent difference.

14.2.2 ICP AND AA DETECTION LIMITS

The laboratory routinely provides Practical Quantitation Limits which are 5 to 10 times method detection limits. MDLs are determined by multiplying appropriate one-sided 99% t-statistic by the Standard Deviation obtained from minimum of seven analysis of a matrix spike containing the analytes of interest at a concentration three to five times the estimated MDL.

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14.3 QUALITY CONTROL DATA ASSESSMENT

For each method used, a quality control data file exists.

14.3.1 QUALITY CONTROL DATA ENTRY

The in-house quality control results, matrix spike percent recovery results, and the blank spike results are computer analyzed. Each test's information is stored in the QA folder by department.

Quality control data is electronically transferred to a spreadsheet for Control Charts. Upper and lower control limits are given in appropriate SW-846 ...ethods.

The program also warns the operator of out-of-control data. All out-of-control data is flagged.

14.3.2 QUALITY CONTROL ANALYTICAL CALCULATIONS

The following calculations are used for the quality control assessment by the computer. These calculations were verified manually.

The mean, x, of a series of replicate measurements of a known quantity calculation:

The standard deviation, s, of a series of measurements to set control limits.

Coefficient of variation c.v.:

s = standard deviation

x = mean of result

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Precision in the laboratory is analyzed by performing duplicates at a 5 percent frequency and analyzing the duplicate data by of the following method:

Precision is calculated by relative percent difference (RPD) between the duplicate samples.

Must fall within the quality control limits. If the lab control is outside limits the following corrective actions must be taken:

- Check the data and recovery calculations.
- Check the reference standard for standard verification.
- If above is acceptable repeat analyses.
- All samples associated with a laboratory control sample which do not meet criteria in Section 5
 must be reanalyzed.

Spike Blank

Must fall within the quality control limits, if the spike blank is outside the limits the following corrective actions must be taken:

- Check the data and recovery calculations
- Check the reference standard for standard verification
- If above is okay repeat analyses

Quality Control Matrix Spike

Must fall within the quality control limits (refer to Section 5) established for each methodology. The corrective actions should be as follows:

- Check the data and recovery calculations
- Check if the blank spike and reference are within range
- · If the matrix spike is out, check other analytes present for possible sample matrix interference
- If sample matrix is identified as the problem this must be footnoted. If the matrix spikes are consistently outside for a particular parameter another methodology may have to be suggested for sample analyses.
- If matrix spike is out, check for presence of that parameter at a high value which may be greater than the amount of spike, causing invalid spike recovery.

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• Replicates

Replicates must be within the range specified by the quality control limits. If reproducibility can not be achieved, and sample matrix interferences are not apparent, batch reanalyses should occur. Calculations, dilutions, etc. should be checked prior to reanalyses.

General Quality Control

Quality Control problems or symptoms should be brought to the attention of a group leader for appropriate corrective action.

All samples should be diluted within working range of standards.

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15.0 CORRECTIVE ACTION

All problems associated with an analytical data package are documented on a Corrective Action Report (C.A.R.). The analyst describes the problem in detail on the C.A.R. and reports the corrective action that was followed. The Group Leader will review the action, assuring it is sufficient to meet project requirements.

The corrective action report (C.A.R.) is used to describe problems associated with the analysis of a sample. The problem is identified in detail and the steps taken to alleviate it are recorded. The problem and corrective action are summarized in the analytical notebook or it can be recorded on a separate report form.

When an out-of-control situation occurs the analysts must use their best judgment and available resources when determining the action to be taken. The out-of-control situation may be caused by more than one problem. The analyst should seek the help of his or her immediate supervisor, QA/QC personnel, or other experienced staff if the cause is not known. The test must not be resumed until the source of the problem and an in-control status is attained. All samples associated with the out-of-control situation should be reanalyzed.

Listed below are steps to be taken when an out-of-control situation occurs. The analyst must:

- demonstrate that all the problems creating the situation were addressed
- document the problem and the action that was taken to correct the problem on a corrective action report form
- document on the corrective action report that control has been achieved
- receive approval (signature) of the group leader or the laboratory manager prior to the release of analytical data associated with the problem are then filed.

When a systematic problem is identified, a systematic solution can be employed to correct the recurring problem. If a systematic solution is not attainable, awareness that the problem exists can be communicated to everyone involved. This can then help solve or prevent the random problem.

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15.1.2 SUPERVISOR RESPONSIBILITIES

- Should follow all of the guidelines above checking for completeness, as well as, quality control limits.
- Will review all quality control measurements prior to data being reported including a review of calculations, correct dilution factors, etc.
- Historical data may be referenced to assist in identifying possible errors in calculations, dilutions,
 etc.

15.1.3 DATA CHALLENGES

All data challenges directed to the lab should be handled in the following fashion:

- · Check historical data.
- Check raw data for dilution or transcription errors.
- Check the appropriate batch QC for anomalies and confirmed matrix effects.
- Sample reanalyses are necessary if none of the above procedures resolve the problem.

15.2 QUALITY CONTROL DATA RESPONSIBILITY

- Method blank acceptance (analyst).
- Spike blank acceptance (analyst) by control limits to be maintained and updated by Group Leaders.
- Precision of method evaluated by R charts maintained and updated (analyst).
- Accuracy evaluated by:
 - Traceable, external reference within EPA acceptance criteria (metals daily, conventionals quarterly).
 - Percent recovery control charts maintained and updated (analyst).
- Final review of data submitted for checks:
 - Completions
 - Accuracy of reporting
 - Calculations
 - · Historical review of data

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15.3 SUGGESTED CORRECTIVE ACTION MEASURES FOR SPECIFIC PROBLEMS

Calibration curve does not have a 0.995 - 1.00 correlation coefficient:

- Plot curve to verify values were plotted correctly.
- Replot curve if necessary to check data entry error.
- If curve range still does not fit acceptance limits, batch reanalysis must occur.

When initial instrument calibration verification is out-of-control limits:

- Check instrument maintenance log and note if any changes have been made which would affect calibration verification.
- Check reagent reference log to verify that reagents have been properly prepared and/or meet specifications.
- Rerun new standards if above have not changed.
- If continued out-of-control, tune instrument according to manufacturer's specified procedure.
- Call for service if problem can not be resolved.

When initial instrument standard verification is out-of-control limits:

- Check reagent reference log to verify that reagents have been properly prepared and/or meet specification.
- Rerun new standard if above have not changed.
- If continued out-of-control prepare new reagents.

When initial GC/MS tuning standard is out-of-control limits:

- Check instrument tune log.
- Check instrument maintenance log and note if any changes have been made which would affect calibration verification.
- Check reagent reference log to verify that reagents have been properly prepared and/or meet specifications.
- Rerun new standards if above have not changed.
- If continued out-of-control, tune instrument according to manufacturer's specified procedure.
- Call for service if problem can not be resolved.
- When Method of Standard Additions slope is not acceptable:

When continuing calibration standard is outside control limits (refer to Section 8):

- Rerun standard to verify outside control.
- If continued out-of-control rerun the initial calibration and rerun previous set.

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16.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Laboratory Manager will prepare a report for the QA Manager addressing any audit deficiencies. Areas may include:

- Safety
- General laboratory overview
- Sample Control
- Method SOPs
- Standards preparation
- Analytical records
- Training files
- Data accuracy
- Data precision

Comprehensive QA records will be maintained to provide evidence of the quality assurance activities. Records of the quality assurance program implementation will be written and retained on file. Quality assurance documents will be archived in the project file along with raw data, laboratory notebooks, and other information pertinent to the project.

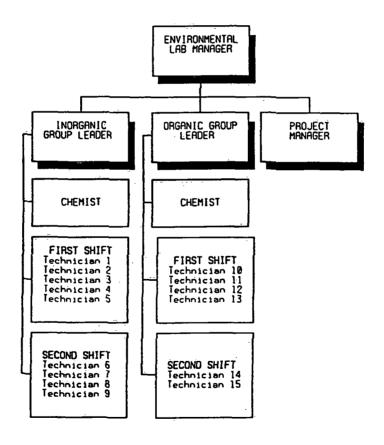
The retention of quality assurance records is essential to provide support in evidentiary proceedings. The original quality assurance records, including the front pages of the chain-of-custody forms for the Dolton and Pekin, IL sites, will be retained in the project file. Long term storage of these documents in archives is described in Subsection 10.4.

The Laboratory Manager will be responsible for ensuring that quality assurance records are properly filed and stored and that they can be readily retrieved.

FIGURE 16-1

ENVIRONMENTAL LABORATORY ORGANIZATIONAL CHART

1994



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17.0 PRIMARY PROJECT PERSONNEL

APPENDIX A

STANDARD OPERATING PROCEDURES SAFETY-KLEEN CORP. ENVIRONMENTAL LABORATORY

Mark A. Hartwig Manager TCLP/Environmental Laboratory

EDUCATION:

Eastern Michigan University Ypsilanti, Michigan B.S. Major - Chemistry Minor - Math, Business

PROFESSIONAL AFFILIATIONS:

American Chemical Society

American Society for Mass Spectrometry

MCM Local Mass Spectrometry Discussion Group

EMPLOYMENT HISTORY:

October 1991 - Present

Safety-Kleen Corp.

12555 W. Old Higgins Road

Elk Grove Village, IL 60007

Position:

TCLP Manager

Responsibilities:

- 1. Manage operation of environmental laboratory.
- 2. Prepare annual business plans and operational budgets.
- 3. Develop staff and departmental functions.
- 4. Prioritize and monitor laboratory production to ensure timely completion of reports.
- 5. Ensure implementation of analytical testing capabilities.

December 1990 - April 1991

IEA, Inc.

126 West Center Court Schaumburg, IL 60195

Position:

Director of Operations - Illinois

Responsibilities:

- 1. P & L of laboratory.
- 2. Business development.
- 3. Ensure professional growth and development of staff.
- 4. Prepare and review capital equipment authorization for expenditure.

April 1991 - October 1991

IEA, Inc.

126 West Center Court

Schaumburg, IL 60195

Position:

Director of Midwest Region Business Development

Responsibilities:

- 1. Develop and maintain high level business relationships with Fortune 500 accounts.
- 2. Prepare and deliver sales presentations to major accounts.
- 3. Development of new product and service offerings.
- Strategic market review and assessment.

RESUME Mark A. Hartwig (continued)

"Writing Procedure Files for the HP-1000 RTL VI GC/MS Data System", a Workshop, Mark A. Hartwig, Hewlett-Packard Company, ASMS Annual Conference, Cincinnati, Ohio (June 1986).

"Interpretation of Toxic Organic Data", Mark A. Hartwig, Annual Meeting-Academy of Certified Hazardous Materials Managers, July 1989.

"Running a Successful Environmental Laboratory", Mark A. Hartwig, Hewlett-Packard Seminar Series "ENVIRO-90", Cleveland, Cincinnati, St. Paul, Lansing, Michigan (November 1989).

"Productivity Gains through Quality Control", Mark A. Hartwig, HAZMAT-CENTRAL, Rosemont, Illinois (March 14, 1990).

Atul Shah GC/MS Chemist TCLP/Environmental Laboratory

EDUCATION:

Bombay University Bombay, India B.S. Major - Chemistry Minor - Botany

PROFESSIONAL AFFILIATIONS:

American Chemical Society

EMPLOYMENT HISTORY:

June 1991 - Present

Safety-Kleen Corp.

P.O. Box 92050

Elk Grove Village, IL 60009-2050

Position:

GC/MS Chemist

Responsibilities:

- 1. Scheduling work for TCLP/VOA azalysis.
- 2. Preventive maintenancion C/MS, Tekmar & Data System.
- 3. Data Rev. -/reporting.
- 4. Training to new operator/technicians.
- 5. PE/QC samples data reporting.
- 6. Purchasing routine/new items.
- 7. Communicating to lab manager/group leader.
- 8. Learning new system/software (target).

March 1990 - May 1991

I.E.A. Illinois Inc.

Schaumburg IL 60195

Responsibilities:

- 1. TCLP/VOCs analysis by using:
 - a. EPA methods 8240/524.2/624
 - b. H.P. GC/MSD with RTE-A System
 - c. Tekmar's ? 1000 and ALS 2016
- 2. Also familiar with A. NEU RAL/ACID analysis by GC/MS.

1989 - March 1990

Responsibilities:

- 1. Working with Finnigan ITD 700 using EPA 524.2 method.
- 2. As a back-up Operator for INCOS 50.
- 3. Familiar with FORMASTER and HPs MSD.

1985 - 1988

Responsibilities:

- 1. Initiated, organized and established an efficient GC section for analysis of VOCs, PCBs, Pesticides, Herbicides, PAH, etc. by EPA methods.
- 2. Trained and supervised three technicians.
- 3. Automated the GCs . peration by adding Autosamplers and a multitasking PC based softs are.
- 4. Troubleshe ing and routine is literance.
- 5. Familiar with indu: ial hy encomples with NIOSH methods.

Matthew Schweik Project Coordinator TCLP/Environmental Laboratory

EDUCATION:

Illinois State University Normal, Illinois B.S. in Economics

EMPLOYMENT HISTORY:

June 1993 - Present

Safety-Kleen Corp. 12555 W. Old Higgins Rd. Elk Grove Village, IL 60007

Position:

Project Coordinator

Responsiblities:

- 1. Handle analytical services duties for projects requiring analyses of groundwater and soil samples.
- Primary contact to discuss the analytical requirements and dimensions of a
 project including prescheduling of analyses, current lab certifications, status
 reports on samples, reporting requirements for projects, ordering of sample
 container kits, and explanation of analytical data shown on reports.

August 1992 - March 1993

First Brands Corporation

Danbury, CT

Position:

Field Manager

Responsibilities:

- 1. Responsible for implementing sales programs through Retail Broker.
- 2. Conduct sales presentations for broker management and personnel.
- 3. Supervise, instruct and train broker personnel on their sales calls.
- 4. Develop sales information for Broker Management.

February 1990 - June 1992

Ideal Industries, Inc.

Sycamore, IL

Position:

Area Manager

Responsibilities:

- Responsible for all sales functions in Eastern Pennsylvania and Western New
 Jersey, including open house, trade shows, seminars, distributor calls and enduser calls.
- 2. Establishing and maintaining business relationships with Authorized Electrical Wholesale Distributors and Electrical Contractors.
- 3. Plan and prepare promotional activities with distributor/contractors by use of direct mailing, local newspapers and discount flyers.
- 4. Conduct product and sales presentations meeting for distributor personnel.
- 5. Collect data, prepare presentations for annual and quarterly business reviews for senior management of each authorized distributor.

Rita Shah Inorganic Group Leader TCLP/Environmental Laboratory

EDUCATION:

University of Bombay Bombay, India B.S. in Chemistry and Biology

PROFESSIONAL AFFILIATIONS:

American Chemical Society

EMPLOYMENT HISTORY:

March 1991 - Present

Safety-Kleen Corp.

12555 W. Old Higgins Rd.

Elk Grove Village, IL 60009-2050

Position:

Inorganic Group Leader

Responsibilities:

- 1. Supervise TCLP extraction and metals analysis area.
- 2. Troubleshoot difficult to handle filter wastes.
- 3. Train staff in sample prep and metals analysis.
- 4. Order and maintain supplies necessary for prep and metals analysis.
- 5. Maintain and troubleshoot ICAP and AA.

1987 - March 1991

Caremark Inc., Baxter Buffalo Grove, IL

Position:

Sr. Analytical Chemist

Responsibilities:

- 1. Performance of stability studies and collection and documentation of data.
- 2. Coordinator for various testing protected for stability studies.
- 3. Responsible for methods development are assay troubleshooting.
- 4. Training and supervision of new personnet

1982 - 1987

Chemical Waste Management

Riverdale, IL

Position:

Analytical Chemist

Responsibilities:

- 1. Analysis of hazardous waste according to CLP protocol using ICP and AA.
- 2. Trained and supervised others in operation of ICP and AA. Familiar with QA/QC in the laboratory.

1976 - 1981

Haffkine Bio-Pharm

Bombay, India

Position:

Quality Control Chemist

Responsibilities:

1. Performed analysis of raw materials, intermediates and packed products according to Pharmacopeia. Performed stability testing of packed products.

HONORS:

Published paper on interferences in graphite furnace at Pittsburgh Conference in March 1986.

Richard H. Cook Organic Group Leader TCLP/Environmental Laboratory

EDUCATION:

Indiana State University
M.A. in Analytical Chemistry
B.S. in Biology

EMPLOYMENT HISTORY:

May 1992 - Present

Safety-Kleen Corp.

12555 W. Old Higgins Rd. Elk Grove Village, IL 60007

Position:

Organic Group Leader

Responsibilities:

- 1. Supervise Volatile analysis, Semi-Volatile Extraction and Semi-Volatile analysis area.
- 2. Train staff in Volatile analysis, Semi-Volatile Extraction and Semi-Volatile analysis.
- Order and maintain supplies necessary for Volatile analysis, Semi-Volatile Extraction and Semi-Volatile analysis.

1988 - 1992

Pitman-Moore, Inc. Terre Haute, IN

Position:

Manager, Gas Chromatography

Responsibilities:

- 1. Responsible for managing the gas chromatography section.
- Direct the method development for identifying trace levels of various chemicals in products, process streams, soil, water and air using gas chromatography, high performance thin-layer chromatography, ion chromatography, thermal analysis, supercritical fluid chromatography and mass spectroscopy.
- Prepares environmental assessments including the design of studies and the writing of documents.

1987 - 1988

Pitman-Moore, Inc. Terre Haute, IN

Position:

Research Scientist

Responsibilities:

1. Responsible for developing methods to detect products or other chemicals in various matrices and to supervise sample tracking and the data archive.

1985 - 1987

Pitman-Moore, Inc. Terre Haute, IN

Position:

Senior Associate Research Scientist

Responsibilities:

- Responsible for modernizing the gas chromatography laboratory and developing methods for the determination of company products in various matrices.
- 2. Supervised technicians.

1980 - 1984

Ashland Chemical Company

Dublin, OH

Position:

Chemist

Responsibilities:

1. Responsible for developing methods using gas chromatography or other analytical techniques to detect compounds of interest in air and water samples for industrial hygiene or environmental purposes.

David R. Reese QA/QC Manager

Mr. Reese has over 15 years of laboratory experience with nine years in the environmental field. Focusing primarily on organic analysis of air, drinking water, petroleum products, soil, waste water and other wastes using ASTM, EPA 500, 600 and 8000 methods on the following instrumentation:

Volatiles by GC/FID, GC/PID and GC/MS Semivolatiles:

BNA, PCBs, Pesticides by GC/ECD and GC/MS
Herbicides by GC/ECD
Organophosphorus Pesticides by GC/NPD
Polynuclear Aromatics by HPLC with UV and Fluorescence detectors.

He has experience in the analysis of Dioxins, BNA, VOA and Pesticide/PCB by EPA/CLP protocols.

Being instrumental in the design and startup of two commercial environmental laboratories, he has been responsible for certifications in over twenty-six states and several private firms. He has also conducted over sixty laboratory audits in the United States, Canada, Puerto Rico and England following both USEPA and ISO 9000 guidelines. In addition, he is a trainer for several laboratories in organic and inorganic methods, good laboratory practices, quality assurance and data review.

He performed the data validation of a 550 sample superfund site and coordinated the resampling and reanalysis with both the consulting engineering firm and the contract laboratory.

He has extensive experience in methods development, writing of SOPs and implementation of quality assurance programs. Recent interests include ICAP and ICAP/MS with automated reporting of QA/QC data by tabulation and quality control charts.

James L. Breece Vice-President, Technical

EDUCATION:

Georgia Institute of Technology Atlanta, GA Ph.D. in Chemistry

Western Carolina College Cullowhee, NC B.S. in Chemistry

EMPLOYMENT HISTORY:

May 1979 - Present

Safety-Kleen Corp.

12555 W. Old Higgins Rd. Elk Grove Village, IL 60007

Position:

Vice-President, Technical

Responsibilities:

1. Responsible for Process/Product Development, General Analytical (Prequal Lab), Environmental Laboratory, Corporate QA/QC, and Methods Development.

1979 - 1980 Chemical Engineer

1980 - 1983 Mgr. of R & D

1983 - 1985 Tech Director

1985 - 1987 General Sales Mgr. Industrial Solvents

1987 - 1990 General Mgr. Tech Services

Responsibilities include process development, product development, and waste characterization using all modern analytical instrumentations. Significant developments include fractional distillation equipment for separation of mixed chlorinated solvents, design and development of drying equipment for waste organic sludges.

Pravin Patel Senior Metals Chemist TCLP/Environmental Laboratory

EDUCATION:

Gujarat University India M.S. in Chemistry B.S. in Chemistry

EMPLOYMENT HISTORY:

May 1992 - Present

Safety-Kleen Corp. 12555 W. Old Higgins Rd. Elk Grove Village, IL 60007

Position:

Senior Metals Chemist

Responsibilities:

1. Responsible for metals analysis.

1990 - 1992

I.E.A., Inc. of Illinois Schaumburg, IL

Position:

Environmental Analytical Chemist

Responsibilities:

Integral participation in set-up of inorganic laboratory. Initial duties included installation of instrumentation and validation of appropriate methods for each within metals and classical chemistry labs. Methods were developed for all parameters within the two labs. Method were developed for all parameters within the two labs. Instrumentation included: Perkin-Elmer Graphite Furnace 5100 PC, Thermo Jarrell Ash ICP 61E, Bacharach MAS-50b Mercury Analyzer, Lachat Auto analyzer. Instrumental in developing SOPs, GLPs, training programs, and compliance standards for EPA, NPDES, OSHA, and other regulatory agencies requirements.

1987 - 1990

Suburban Laboratories

Hillside, IL

Position:

Environmental Analytical Chemist

Responsibilities:

EPA approved Environmental laboratories dealing with wastes and waste water analysis. Major responsibilities includes analytical and instrumental analysis quantitative and qualitative analysis and wet analysis of wastes, water foods, pharmaceutical, herbicides and pesticides. Usage of analytical instruments such as Atomic Absorption, Spectrometer Inductively ,coupled Plasma (ICP), Gas Chromatographs with ECD, FID and TCD detectors, IR, HPLC, HPLC with Anion Detector, HGA Graphite furnace for inorganic elemental analysis, TOC, TOX, etc. Well aware with EPA, FDA, and OSHA standards and regulations.

1983 - 1987

P.M.S. Consolidated Elk Grove Village, IL

Position: Lal

Lab Chemist

Responsibilities:

Involved in analytical and instrumental analysis of Polymers qualitatively and quantitatively including wet analysis methods. Usage of analytical instruments includes Melt Flow Index, Brook Field viscometer, Perkin-Elmer Infra red Spectrometer, etc. Also involved in matching colors and making formulations for plastics by using sophisticated ACS color computer systems.

Mark Scheuer Senior GC/MS Chemist TCLP/Environmental Laboratory

EDUCATION:

University of Kentucky Lexington, KY M.S. in Analytical Chemistry

Central Michigan University Mt. Pleasant, MI B.S. in Chemistry

EMPLOYMENT HISTORY:

April 1992 - Present

Safety-Kleen Corp.

12555 W. Old Higgins Rd. Elk Grove Village, IL 60007

Position:

Senior GC/MS Chemist

Responsibilities:

Responsible for the analysis of samples for VOA and BNA constituents using EPA 8240 and 8270 methodology. Also involved in automation of the GC/MS data systems using an INGRES database and C-programming.

May 1990 - 1992

Martin Marietta Energy Systems

Oak Ridge, TN

Position:

Plasma Emission Laboratory Supervisor

Responsibilities:

Some of the responsibilities of this position include writing standard operating procedures, employee training, methods development, and instrument maintenance for two Inductively Coupled Argon Plasma instruments. Water, soil, wastestream, filter, and urine samples are analyzed for up to 35 elements. Assisted in creating a computer program to simplify data management in order to handle the increasing number of samples received. the program designed incorporates QA/QC requirements set by the Environmental Protection Agencies (EPA) Statement of Work (SW-846), 3rd Edition 11/90. Also responsible for defining roles and assisting in setting goals of the six analysts within the lab in order to produce the most efficient environment.

November 1988 - May 1990

Martin Marietta Energy Systems

Oak Ridge, TN

Position:

Gas Chromatography Mass Spectroscopist (GC/MS)

Responsibilities:

Volatile and Semivolatile analyses were performed following EPA Certified Laboratory Protocol (CLP) procedures. Several types of samples were analyzed on a routine basis including groundwaters, soils, and wastestreams. Developed experience with RTE-6 and RTE-A computer systems by designing computer programs to streamline data handling. As a GC/MS operator I was also responsible for maintenance of the Hewlett Packard HP-5985 and HP-5970 MSD GC/MS units.

July 1986 - November 1988

International Technology Corp.

Knoxville, TN

Position:

Inorganic Technical Specialist

Responsibilities:

Performed instrument maintenance for a Jarrell-Ash Inductively Coupled Argon Plasma and Atomic Absorption units. Conducted routine analyses on groundwaters, soils and process waste samples using EPA procedures. some of the methods utilized were obtained from EPA CLP and EPA SW-846.

APPENDIX VII-B

PROJECT CONSTITUENT LIST DOLTON RECYCLE CENTER

Table VII-B-1. Inorganic Constituents, RFI Phase I, Dolton Recycle Center.

Constituent	Method	Method Detection Limit (mg/kg)
Arsenic	SW-846 7060	1.25
Barium	SW-846 6010	2.0
Cadmium	SW-846 6010	2.0
Chromium	SW-846 6010	4.0
Lead	SW-846 6010	11.0
Mercury	SW-846 7471	0.04
Selenium	SW-846 7740	0.9
Silver	SW-846 6010	3.0

Table VII-B-2. Volatile Organic Compounds, RFI Phase I, Dolton Recycle Center.

Constituent	Method	Method Detection Limit (mg/kg)
Acetone	SW-846 8240	
Benzene	SW-846 8240	
Bromodichloromethane	SW-846 8240	
Bromoform	SW-846 8240	
Bromomethane	SW-846 8240	
Carbon disulfide	SW-846 8240	
Carbon tetrachloride	SW-846 8240	
Chlorobenzene	SW-846 8240	
Chloroethane	SW-846 8240	
Chloroform	SW-846 8240	
Chloromethane	SW-846 8240	
	SW-846 8240	
1,1-Dichloroethane	SW-846 8240	
	SW-846 8240	
1,1-Dichloroethylene	SW-846 8240	0.005
cis-1,2-Dichloro-		
ethylene	SW-846 8240	0.005
trans-1,2-Dichloro-		
ethylene	SW-846 8240	0.005
1,2-Dichloropropane	SW-846 8240	0.005
cis-1,3-Dichloro-		
propene	SW-846 8240	0.005
trans-1,3-Dichloro-		
propene	SW-846 8240	0.005
Ethylbenzene	SW-846 8240	0.005
2-Hexanone	SW-846 8240	0.050
Methylene chloride	SW-846 8240	0.005
Methyl ethyl ketone	SW-846 8240	0.100
4-Methyl-2-pentanone	SW-846 8240	0.050
Styrene	SW-846 8240	0.005
1,1,2,2-Tetrachloro-		
ethane	SW-846 8240	0.005
Tetrachloroethylene	SW-846 8240	0.005
Toluene	SW-846 8240	0.005
1,1,1-Trichloro		
ethane	SW-846 8240	0.005
1,1,2-Trichloro-		
ethane	SW-846 8240	
Trichloroethylene	SW-846 8240	0.005
Trichlorofluoro-		
methane	SW-846 8240	0.010
Trichlorotri-		
fluoroethane	SW-846 8240	
Vinyl Acetate	SW-846 8240	
Vinyl Chloride	SW-846 8240	
Xylene (total)	SW-846 8240	0.005

Table VII-B-3. Semi-Volatile Organic Compounds, RFI Phase I, Dolton Recycle Center.

Constituent	Method	Method Detection Limit (mg/kg)
Acenaphthene	SW-846 8270	0.660
Acenaphthylene		0.660
Anthracene	SW-846 8270	0.660
Benzo(a) anthracene	SW-846 8270	0.660
	SW-846 8270	0.660
Benzo(b) fluoranthene	SW-846 8270	0.660
Benzo(k) fluoranthene	SW-846 8270	0.660
Benzo (ghi) perylene	SW-846 8270	0.660
Benzo(a) pyrene	SW-846 8270	0.660
Benzyl alcohol	SW-846 8270	1.300
Bis(2-chloroethoxy)		
methane	SW-846 8270	0.660
Bis(2-chloroethyl)		
ether	SW-846 8270	0.660
Bis(2-ethylhexyl)		
phthalate	SW-846 8270	0.660
4-Bromophenyl phenyl		
ether	SW-846 8270	0.660
Butyl benzyl phthalate	SW-846 8270	0.660
p-Chloroaniline	SW-846 8270	1.300
p-Chloro-m-cresol	SW-846 8270	0.660
2-Chloronaphthalene	SW-846 8270	0.660
2-Chlorophenol	SW-846 8270	0.660
4-Chlorophenyl		
phenyl ether	SW-846 8270	0.660
Chrysene	SW-846 8270	0.660
m-cresol	SW-846 8270	0.660
o-cresol	SW-846 8270	0.660
p-cresol	SW-846 8270	0.330
Dibenz (a, h) anthracene	SW-846 8270	0.660
Dibenzofuran	SW-846 8270	0.660
	SW-846 8270	0.660
o-Dichlorobenzene	SW-846 8270	0.660
m-Dichlorobenzene	SW-846 8270	0.660
p-Dichlorobenzene	SW-846 8270	0.660
3,3'-Dichloro-	DW 010 0270	0.000
benzidine	SW-846 8270	1.300
2,4-Dichlorophenol	SW-846 8270	0.660
Diethyl phthalate	SW-846 8270	0.660
2,4-Dimethylphenol	SW-846 8270	
Dimethyl phthalate	SW-846 8270	0.660
2,4-Dinitrophenol	SW-846 8270	0.660
2,4-Dinitrophenoi 2,4-Dinitrotoluene	SW-846 8270	3.300
2,4-Dinitrotoluene		0.660
	SW-846 8270	0.660
Di-n-octyl phthalate	SW-846 8270	0.660
Fluoranthene	SW-846 8270	0.660

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Table VII-B-3. Semi-Volatile Organic Compounds, RFI Phase I, Dolton Recycle Center (continued).

Constituent	Method	Method Detection Limit (mg/kg)
Fluorene	SW-846 8270	0.660
Hexachlorobenzene	SW-846 8270	0.660
Hexachlorobutadiene	SW-846 8270	0.660
Hexachlorocyclo-		
pentadiene	SW-846 8270	0.660
Hexachloroethane	SW-846 8270	0.660
Indeno(1,2,3-c,d)		
pyrene	SW-846 8270	0.660
Isophorone	SW-846 8270	0.660
2-Methyl-		
4,6-dinitrophenol	SW-846 8270	1.300
2-Methylnaphthalene	SW-846 8270	0.660
Naphthalene	SW-846 8270	0.660
o-Nitroaniline	SW-846 8270	3.300
m-Nitroaniline	SW-846 8270	3.300
p-Nitroaniline	SW-846 8270	ND
Nitrobenzene	SW-846 8270	0.660
o-Nitrophenol	SW-846 8270	0.660
p-Nitrophenol	SW-846 8270	3.300
Pentachlorophenol	SW-846 8270	3.300
Phenanthrene	SW-846 8270	0.660
Phenol	SW-846 8270	0.660
Pyrene	SW-846 8270	0.660
1,2,4-Trichlorobenzene	SW-846 8270	0.660
2,4,5-Trichlorophenol	SW-846 8270	0.660
2,4,6-Trichlorophenol	SW-846 8270	0.660
_		

ND = Not Determined

APPENDIX VII-C

STANDARD OPERATING PROCEDURES S-K ENVIRONMENTAL LABORATORY

- C-1 INORGANIC ANALYSIS PROTOCOL, METALS BY ICAP EMISSION SPECTROMETRY
- C-2 INORGANIC ANALYSIS PROTOCOL, METALS BY GRAPH-ITE FURNACE ATOMIC ABSORPTION SPECTROMETRY
- C-3 ORGANIC ANALYSES PROTOCOL, GAS CHROMATOGRAPHY/ MASS SPECTROMETRY (GC/MS) ANALYSIS OF VOLATILE ORGANIC COMPOUNDS
- C-4 ORGANIC ANALYSES PROTOCOL, GAS CHROMATOGRAPHY/ MASS SPECTROMETRY (GC/MS) ANALYSIS OF SEMI-VOLATILES
- C-5 ANALYST TRAINING PROTOCOL

APPENDIX VII-C-1

INORGANIC ANALYSIS PROTOCOL METALS BY ICAP EMISSION SPECTROMETRY

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TITLE:

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF METALS IN ACID DIGESTED WASTE MATERIALS BY INDUCTIVELY COUPLED ARGON

PLASMA -- ATOMIC EMISSION SPECTROMETER

(BASED ON: USEPA 6010)

(KEYWORDS: ICAP, EMISSION SPECTROMETRY, METALS)

1. SCOPE AND APPLICATION

- 1.1 The inductively coupled argon plasma spectrometer is used for multiple and simultaneous metal content quantitation of acid digested waste samples.
- 1.2 Samples must be solubilized or digested using the Method 3050, 3010 or 3020 and are analyzed by Inductively Coupled Plasma Spectrometry.
- 1.3 Table 1 lists metals for which this method applies along with recommended wavelengths and typical estimated instrumental detection limits using cross-flow pneumatic nebulization.
- 1.4. The measurement of metal content is used to characterize the waste sample for TCLP.

2. SAFETY AND WASTE HANDLING

2.1 <u>FIRE</u> - Do not open samples containing flammable material near the spectrometer. The fumes and vapors released may migrate to the plasma of the torch of the spectrometer.

<u>SPILL</u> - If any spill occurs, wipe with an absorbent wipe. Used wipes and plastic pipets must be placed in a metal container lined with a plastic trash bag.

The metal top must be kept on the container at all times except when adding or removing contents. In the event of a fire, the top should quickly smoother it. Any fire involving these materials must be treated as Class A fires. The contents must be removed daily and may be disposed of in the regular trash.

2.2 <u>EYE CONTACT</u> - Safety glasses with side shields are mandatory. Any eye contact with a chemical must be removed by thorough washing and follow-up action, as detailed in the Safety Plan.

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2.3 <u>HAND CONTACT</u> - Samples may contain toxic metals. Use of disposable vinyl or latex gloves provides adequate protection from contact with the samples. All skin contact must be washed off immediately.

- 2.4 <u>RESPIRATORY</u> Exposure to the vapors is harmful. Make sure the exhaust system over the spectrometer is working properly during the operation of the plasma torch.
- 2.5 <u>WASTE DISPOSAL</u> The end of the drain tube must be submerged in the waste container behind the unit to collect spent sample from the spectrometer. The container must be kept a minimum of 40% and a maximum of 80% full with aqueous solution.

Standard and digested spent samples should be neutralized and then returned to storage for later disposal.

3. SUMMARY OF METHOD

3.1 The method describes a technique for the simultaneous multielement determination of metals in aqueous solution. The basis
of the method is the measurement of atomic emission by an optical
spectroscopic technique. Samples are nebulized and the aerosol
produced is transported to the inductively coupled argon plasma
(ICAP) torch where excitation occurs. The characteristic
emissions produced are dispersed by a grating and the intensities
of the spectral lines are monitored by photomultiplier tubes.

The currents from the photomultiplier tubes are processed and controlled by a computer system. Computerization of the ICAP procedure includes automatic matrix matching of samples and standards.

In those cases where such matching is inadequate to adjust for background variation, wavelength specific corrections are incorporated into the automated procedure after the electronic signal has been adjusted.

4. SAMPLE HANDLING AND PRESERVATION

4.1 All the samples are aqueous solutions of acid-digested samples and are stable under ambient conditions.

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4.2 The ICAP analysis requires, minimally, a 25 mL sample in a polyethylene or glass container (if hydrofluoric acid is not used).

5. INTERFERENCES

5.1 SPECTRAL INTERFERENCES can be categorized as (1) overlap of a spectral line from another element.; (2) unresolved overlap of molecular band spectra; (3) background contribution from continuous or recombination phenomena; and (4) background contribution from stray light from the line emissions of high concentration elements. The first of these effects can be compensated by utilizing a computer correction of the raw data, requiring the monitoring and measurement of the interfering element. The second effect may require selection of an alternate wavelength.

The third and fourth effects can usually be compensated for by a background correction adjacent to the analyte line.

In addition, when using simultaneous multi-element instruments the analyst must verify the absence of spectral interference from an element that could occur in a sample but for which there is no channel in the instrument array. Table II indicates the potential spectral interferences for the recommended wavelengths. The interference is expressed as analyte concentration equivalents of 1 mg/L or more, (i.e. false analyte concentrations) arising from 100 mg/L of the interference element. For example, assume that Antimony is to be determined (@ 206.83 nm) in a sample containing 100 mg/L of Chromium. From Table II, , 100 mg/L of Cr would yield a false signal for Antimony equivalent to 2.9 mg/L. The interference effects must be evaluated for each instrument since intensities will vary with operating conditions, power, viewing height, argon flow rate, and other factors.

The following are example spectral interferences, some of which are not listed in Table II.

<u>Element</u>	<u>Interferent</u>
As	Al, Fe, Cr, Co, Mo, Pt, Si, V
Be	Fe, Mo
Cd	Al, Cr, Fe, Ni, Pt, Tl
Mo	Cr, Fe, Ni, Pt, V
Pb	Al, Co, Cu, Fe, Mo, Ni, Pt, Si, Tl, V
Se	Co, Fe, Mo, Pt, V
Tl	Ca, Cr, Mo, Ni, V

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5.2 PHYSICAL INTERFERENCES are generally considered to be effects associated with the sample nebulization and transport processes. Such properties, such as changes in viscosity of the sample being nebulized, can cause inaccuracies, especially in samples containing metals in very high concentrations. The use of a peristaltic pump may lessen these interferences. If these types of interferences are operative, they must be reduced by dilution of the sample and/or utilization of standard addition techniques. Another problem which can occur from high dissolved solids is salt buildup at the tip of the nebulizer. This affects aerosol flow rate, causing instrumental drift.

Wetting the argon prior to nebulization, using a tip washer, diluting the sample, and changing the sample injection tube eliminate this problem.

5.3 CHEMICAL INTERFERENCES are characterized by molecular compound formation, ionization effects, and solute vaporization effects. They can be minimized by carefully selecting the operating conditions (such as, incident power, observation position, and so forth), buffering the sample, matrix matching, and by using standard addition procedures. These types of interferences can be highly dependent on matrix type and the specific analyte element.

6. APPARATUS

6.1 Inductively Coupled Argon Plasma Simultaneous Emission Spectrometer (ICAP)

Thermo Jarrell Ash 590 Lincoln Street, P.O. Box 9036, Waltham, MA 02254-9036 (TJA) Model 61

- **6.2** Peristaltic pump Gilson Minipulse 1 supplied with spectrometer
- 6.3 Computer A 286 or better PC with at least 40 MB hard drive with a color monitor.
- **6.4** Replacement Parts: An inventory of spare parts for emergency use should be kept.

Plasma torch, TJA Part No. 190-400-54 Chamber, TJA Part No. 190-400-65 Fixed cross flow nebulizer, TJA Part No. 90-790

6.5 Exhaust for torch - contract locally

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6.6 Disposable gloves -

VINYL - Prepowdered (VWR Cat. Nos. 32915-461, 32915-483, 32915-483, 32915-508)

LATEX - (VWR Cat. Nos. 32917-875, 32917-897)

- 6.7 Disposable paper wipes, 4.5" x 8.5" (Kimwipes, VWR Cat. No. 21905-025)
- 6.8 Polypropylene narrow mouth Boston round bottles, 125 mL and 1000 mL (Nalgene, VWR Cat. Nos. 16067-066, 16067-124)
- 6.9 Wash bottle, wide mouth unitary, 500 mL (Nalgene, VWR Cat. No. 16651-595)
- 6.10 Centrifuge Tubes, disposable, graduated, optical polypropylene, 50 mL, (Baxter Cat. No. C3978-50)
- 6.11 Rack, Centrifuge tube (Nalgene, Part No. 5930-0030, Fisher Cat. No. 14-8090)
- **6.12** Disposable pipets
- **6.13** Adjustable micro-pipette and tips, 10 to 1000 μ L (VWR Cat. Nos. 53499-398, 53511-904)
- 6.14 Goggles (Baxter Cat. No. G7507)

7. REAGENTS/STANDARDS

All reagents must have the following clearly identified either on the container or in a notebook: name, source, lot#, purity, date of receipt, date opened.

- 7.1 Nitric acid, concentrated, reagent grade. (VWR Cat. No. 4815-3)
- 7.2 Deionized Water.
- 7.3 Sodium carbonate, crystalline powder. (VWR Cat. No. EM-SX0405-5)

7.4 INSTRUMENT BLANK Prepare 5% HNO3 solution with DI water.

Let stand until the solution cools to room temperature.

NOTE: The instrument blank should be used as the standby wash solution between analysis as opposed to DI water. This reduces the vapor pressure difference in the nebulizer between water and acidic solutions.

7.5 MULTI-ELEMENT PLASMA STANDARD STOCK SOLUTIONS, 1000 mg/L, Inorganic Ventures. Duplicate sets are needed, one each from two different lots. The newer (date received) of the sets should be used for the CALIBRATION CHECK STANDARD, CCS, and the older should be used for the INSTRUMENT CALIBRATION STANDARDS.

SK-CAL-1	$1,000 \mu g/mL$	Sb .
SK-CAL-2	1,000 µg/mL	B, Mo, Sn, Ti
SK-CAL-3	10,000 µg/mL	Ca, Mg, K, Na
SK-CAL-4	$1,000 \mu g/mL$	Al, As, Ba, Be, Cd, Cu, Cr, Co, Fe,
		Pb, Mn, Ni, Se, Sr, Tl, V, Zn
	$100 \mu g/mL$	Ag

NOTE: If problems arise with silver use single element Ag standard. All standards have a one year expiration date.

7.7 CALIBRATION STANDARDS

- 7.7.1 To each of 7 volumetric flasks, add 60 mL deionized water, and 5 mL HNO3. Mix the reagent well before adding the standard solutions. The standards may be combined for the low and mid-point concentrations.
- 7.7.2 Pipette the following into each corresponding flask:

STD	Stock Standard	Conc.	Volume <u>Added</u>	Final <u>Volume</u>
BLANK 5% HNO3	Conc HNO3		5 mL	100 mL
CAL-4 - 1 ppm	SK-CAL-4	1000	0.10 mL	100 mL
CAL-4 - 5 ppm	SK-CAL-4	1000	0.50 mL	100 mL
CAL-4 - 10 ppm	SK-CAL-4	1000	1.0 mL	100 mL
CAL-3 - 10 ppm	SK-CAL-3	10000	0.1 mL	100 mL
CAL-3 - 20 ppm	SK-CAL-3	10000	0.2 mL	100 mL
CAL-3 - 30 ppm	SK-CAL-3	10000	0.3 mL	100 mL

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Let standards cool to room temperature. Then, dilute to the 100 mL mark with deionized water and shake well.

If Sb is required for analysis mix SK-CAL-1 with SK-CAL-4. If B. Mo, Sn, or Ti required for analysis, prepare standards as follows:

<u>s</u> ,	<u>rds</u>	STOCK STD	CONC PPM	VOLUME <u>ADDED</u>	FINAL <u>VOLUME</u>
CAL-2	1 ppm	SK-CAL-2	1000	0.10 mL	100 mL
CAL-2	5 ppm	SK-CAL-2	1000	0.50 mL	100 mL
CAL-2	10 ppm	SK-CAL-2	1000	1.0 mL	100 mL

7.8 CALIBRATION CHECK STANDARD (CAL CHK) To prepare, add to a 100 mL volumetric flask, 60 mL of deionized water and 5 mLs of concentrated nitric acid.

Pipet the following standards into 100 mL Vol. flask:

0.50 mL of SK-CAL-4 and SK-CAL-1 (SK-CAL-2 if required)

NOTE: All these standards must be from a different source than calibration standard.

Let the standard solution cool to room temperature and dilute to the 100 mL mark with deionized water and shake well.

7.9 INTER-ELEMENT CHECK STANDARD (IECS) - The IECS is prepared to contain known concentrations of interfering elements that will provide an adequate test of the correction factors. The elements and their concentrations are:

Inorganic Ventures, Inc.

Interference Std ICSA:	Interference Std. ICSB:			
5000 μg/mL: Al, Ca, Mg	100 μg/mL each: Ag, Cd, Ni, Pb, Zn			
2000 μg/mL: Fe	50 μg/mL each: Ba, Be, Co, Cr, Cu, Mn, V			

ICSA and ICSB are diluted to 1/10 and 1/100 respectively in the acidic matrix and then analyzed. All elements that are reported must be within $\pm 20\%$ of the true value.

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7.10 MATRIX SPIKE STANDARD - The matrix spiking solution is a custom mix solution SK-TCLP mixture which contains the following elements at a final concentration of TCLP Regulatory Limit.

Lead Barium 500 ppm 1000 ppm 500 ppm Selenium 100 ppm Arsenic 500 ppm Cadmium 100 ppm Silver Chromium 500 ppm

Use of 0.2 mL of above matrix spike standard for 20 mL of sample (final volume 100 mL) will result in the following concentration:

2.0 ppm Ba

1.0 ppm each: As, Ag, Cr, Pb

0.2 ppm each: Se, Cd

If Cu, Ni, Zn, Sb and Tl are the analytes, add 0.2 mL of 1000 ppm Cu, Ni and Zn; 0.10 mL 1000 ppm for Tl; and 0.20 mL of 100 ppm Sb.

- 7.11 Nitrogen gas (Zero Grade).
- 7.12 Liquid argon (Zero Grade). Zero grade compressed argon is acceptable as a reserve.

8. PREVENTIVE MAINTENANCE

- 8.1 A dirty torch may cause plasma ignition and stability problems, low sensitivity and bad reproducibility. The torch requires cleaning at least once a month. Whenever the torch has been touched or replaced, both horizontal and flow rate optimization should be performed. Whenever the torch has been replaced, the height of the torch should be adjusted.
- The torch needs to be placed at the center of the copper coil and 8.2 directly above the chamber. The plasma cannot be ignited if the torch is not properly aligned.
- Clogging of sample delivery tubes or nebulizer may give low 8.3 sensitivity. The joints of the stepdown tubes and the joint at the nebulizer inlet are especially susceptible to clogging. Sample delivery tubes should be checked daily for clogging.
- DAILY Check/replace sample delivery tubes. 8.4
- BIWEEKLY Prepare new sets of CALIBRATION and INSTRUMENT CONTROL 8.5 STANDARDS.

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- 8.6 ROUTINELY Back up data from hard disk and then purge data to maintain enough disk space for storing data.
- 8.7 BIWEEKLY Check the water level in the coolant system and add distilled water if necessary.
- 8.8 Clean generator and controller filters in back of the instrument.
 This is done as needed.
- 8.9 Clean torch, spray chamber and nebulizer. Replace sample delivery tubes. This is done as needed.
- 8.10 Clean the autosampler rods daily, also lubricate them with silicone grease to assure proper operation.
- 8.11 SEMI ANNUALLY Change vacuum pump oil. If operating conditions are abnormal, change oil more frequently.
- 8.12 ANNUALLY Nothing scheduled.
- 8.13 All maintenance work must be documented in the maintenance log book.

9. TROUBLESHOOTING/CORRECTIVE ACTION

9.1 Low sensitivity may be due to (a) clogged tip of the torch; (b) dirty torch; (c) clogged sample delivery tubes or (d) clogged nebulizer.

For cleaning, the sapphire tip, or the quartz torch may be submerged in 1:1 concentrated hydrochloric-nitric acid.

Note: Never use HYDROFLUORIC ACID for cleaning the quartz torch as that would cause permanent damage to the torch.

Clogged sample delivery tubes should be cut or replaced.

The O-ring and the sample carrier gas screw should be removed and then the nebulizer sonicated in 10% conc. nitric acid (v/v) for 5 minutes, rinsed with DEIONIZED water and then sonicated in methanol for 3 minutes.

9.2 Ignition problems might be caused by improper torch alignment or dirt in the torch tip..

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9.3 Occasionally the capillary in the nebulizer becomes plugged with lint dust or suspended solids causing a decrease in analytical sensitivity or no signal at all. This can be checked by measuring the sample uptake rate (mL/min.)

Disconnect the nebulizer from the mixing chamber and clean it in an ultrasonic cleaner as recommended.

Sometimes the peristaltic pump tubing through which the sample is nebulized is similarly plugged causing a decrease in analytical sensitivity or no signal at all. Hence, the tubing should be changed at least once every two weeks and if necessary more often.

- 9.4 Failure in initialization of the analysis may be caused by sudden power failure or frequency change. Resetting the HV power (at the back of the instrument) can remedy this problem.
- 9.5 Streams in the torch can be caused due to air leaks. Check all the tubing connections on torch to make sure thereis no leak problem.
- 9.6 SERIAL DILUTION If the analyte concentration is higher than 10% above the highest calibration level, a serial dilution of the sample must be made and analyzed. The dilution analysis should be within ±10 percent of the original determination. If it is not, a chemical or physical interference effect should be suspected.
- 9.7 SPIKE ADDITION The recovery of a spike addition at a minimum level of 10X the instrumental detection limit (maximum 100X) should fall within the established control limit for that matrix. If not, a matrix effect should be suspected. The use of a standard addition analytical procedure can usually compensate for this effect.
- 9.8 STANDARD ADDITION The standard-addition technique involves adding known amounts of standard to one or more aliquots of the processed sample solution. This technique compensates for a sample constituent that enhances or depresses the analyte signal, thus producing a different slope from that of the calibration standards. It will not correct for additive interferences which cause a baseline shift.

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The simplest version of this technique is the single-addition method, in which two identical aliquots of the sample solution, each of Volume V_x , are taken. To the first (labeled A) is added a small volume V_s of a standard analyte solution of concentration C_s . To the second (labeled B) is added the same volume V_s of the solvent. The analytical signals of A and B are measured and corrected for non-analyte signals. The unknown sample concentration C_x is calculated:

$$C_x = \frac{S_b V_s C_s}{(S_a - S_b) V_x}$$

where S_a and S_b are the analytical signals (corrected for the blank) of solutions A and B, respectively. V_s and C_s should be chosen so that S_a is roughly twice S_b on the average. It is best if V_s is made much less than V_x , thus C_s is much greater than C_x , to avoid excess dilution of the sample matrix. If a separation or concentration step is used, the additions are best made first and carried through the entire procedure. For the results of this technique to be valid, the following limitations must be taken into consideration:

- 1. The analytical curve must be linear.
- The chemical form of the analyte added must respond the same way as the analyte in the sample.
- 3. The interference effect must be constant over the working range of concern.
- 4. The signal must be corrected for any additive interference.

The absorbance of each solution is determined and then plotted on the vertical axis of a graph, with the concentrations of the know standards plotted on the horizontal axis. When the resulting line is extrapolated back to zero absorbance, the point of interception of the abscissa is the concentration of the unknown. The abscissa on the left of the ordinate is scaled the same as on the right side, but in the opposite direction from the ordinate.

NOTE: The standard addition technique does not detect coincident spectral overlap. If suspected, use of computerized compensation, an alternate wavelength, or comparison with an alternate method is recommended.

9.9 COMPARISON WITH ALTERNATE METHOD OF ANALYSIS - When investigating a new sample matrix, comparison tests may be performed with other analytical techniques such as atomic absorption spectrometry or other approved methodology.

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10. QUALITY CONTROL

10.1 INITIAL SETUP - Prior to instrument calibration all metals must be run individually to determine the inter-element correction factors. Table II provide guidelines of interfering elements and approximate amounts. This is only done during instrument setup or when the IEC standards fail to meet the criteria. This should be well documented.

10.2 CALIBRATION - Analyze an instrument blank before the Calibration standards as the first point in a four point calibration curve. The next three levels of standards are run establishing a calibration curve. The curve must have a correlation coefficient of 0.995 or greater.

The high level standards must be run after the 3 point calibration curve with results being \pm 5% of the true value for all elements.

- 10.3 DAILY: INTER-ELEMENT CHECK STANDARDS The inter-element check standard (IECS) is to be run at the beginning and end of each analytical batch or twice during every 8-hour work shift, which ever is more frequent. Results of all elements must be within ± 20% of the expected value. The IECS provides verification of inter-element and background correction factors.
- 10.4 DAILY: CALIBRATION CHECK STANDARD Run ICV and ICB after high level standards. Run CCV and CCB after every ten samples. Values must be within ± 10% of the true value. If ICV or CCV is out of control reanalyze ten samples prior to bad QC.
- 10.5 DAILY: MATRIX SPIKES (MS) Every sample matrix analyzed must be matrix spiked or for TCLP extract run spike every 10 samples.

Results for samples with excessive native material that are out of control must be reviewed and documented.

The percent recovery is calculated as follows:

Recovery = 100% * [(A-B)/T]

Where:

A = Concentration of Spiked Sample

B = Background Concentration

T = Known True Value of the Spike

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The spike recovery should fall within the established control limits. If spike recovery is outside the established limit rerun sample. If recovery still out of control redigest the sample. If spike recovery is below 50% use method of standard addition with the exception of Ag and Ba where presence of chloride and sulfate can cause low spike recovery. If spike recovery is above 50% but below established limits, a confirmative remark must accompany with the report e.g. "The low spike recovery is confirmed due to sample matrix.".

10.6 DAILY MATRIX SPIKE DUPLICATE (MSD) - Every 20 samples, analyze a matrix spiked sample. Percent recovery is to be calculated for the MSD in order to calculate the relative percent difference (RPD). The RPD is calculated as follows:

R = MSR-SR * 100% where: R = % recovery

> MSR = matrix spike result MA

> > SR = sample result

MA = matrix spike amount

Relative percent difference should be \pm 20%. If % RSD is out of acceptance range rerun the sample, if still out of control redigest the sample.

10.7 If concentration of the analyte is within ± 20% of the regulatory limit, analyze that element by Method of Standard Addition procedure.

11. PROCEDURE

For daily standardization and autosampler set up,

refer to the Instrument Manuals.

11.1 STARTUP:

11.1.1 Make sure that the standby (SB) and fatigue (FAT) lights on front panel are lit and the HV power switch (back of instrument) is ON. If the lights are not on, then perform a cold start (see TJA OPERATOR'S MANUAL manual).

Make sure the argon and nitrogen tanks are not empty. 11.1.2 Turn their main valves ON. Cue set as follows:

> Nitrogen 15 psi Argon 70 psi

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- 11.1.3 Turn ON the plasma work coil coolant water.
- Make sure the BLUE R.F. OFF lamp on the generator 11.1.4 control panel is lit. If not, check water and argon for adequate supply pressure and make sure that the plasma chamber door is properly closed.
- 11.1.5 Correctly position the sample tubing in the peristaltic pump. Use the white clamp for this tubing. Set pump at an optimized rate of delivery 1.6 - 1.8 mL/min. Turn the flow switch in the direction so as to aspirate the rinse solution (deionized water) into the nebulizer.
- Turn ON the TORCH, AUXILIARY and SAMPLE gas toggle 11.1.6 switches. In the ON position, the bottom of each ball should be at the following setting or within the figures in parentheses as a guideline:

TORCH	16	(16-18)
AUXILIARY	0.4	(0.4-0.6)
SAMPLE (Aqueous)	0.7	

- 11.1.7 Wait 3 minutes.
- Make sure the instrument is operating under the 11.1.8 following conditions:

Vacuum Meter Red Needle Approx. 20 mTorr 10 or < 10 mTorr Black Needle Power Control Manual Power & Forward Power On Load Control Turning Automatic Power Knob (all the way, counterclockwise) Blue R.F. light Illuminated Automatic Power Control Locked Automatic Forward Power 585

Control Set at

NOTE: NOW, PLASMA IS READY TO BE IGNITED.

- Turn OFF the SAMPLE gas toggle switch. 11.1.9
- 11.1.10 Press the red R.F. ON button.

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11.1.11 To ignite, slowly turn the POWER knob clockwise until the FORWARD R.F. POWER meter reads 0.5 kW.

NOTE: NEVER LOOK DIRECTLY AT THE PLASMA PLUME. ONLY LOOK THROUGH THE VIEW PORT.

11.1.12 Press the IGNITOR button on the front panel of the generator. When a faint filamentary plasma is swirling in the outer tube of the torch, gradually increase the FORWARD R.F. POWER until the plasma ignites. This should occur before the power level reaches 1.5 kW.

STOP if the plasma ignites with a pop, if the FORWARD R.F. POWER reaches 1.5 kW., the yellow OL (Overload) reset light is lit, or the FORWARD R.F. POWER meter reading drops to zero. IN THE EVENT ANY OF THESE OCCUR:

- a. Return POWER knob to zero.
- b. If the OL Reset light is lit, turn the POWER knob counterclockwise and press the OL button. Then turn up FORWARD POWER to 0.5 kW, and try to reignite.
- 11.1.13 Once the plasma is lit, turn the AUTOMATIC POWER CONTROL switch to the AUTOMATIC position (upward).
- 11.1.14 Turn the POWER knob clockwise to yield a power greater than the Automatic set point.
- 11.1.15 Make sure the AUTOMATIC POWER CONTROL is set at 5.08 and the POWER METER READING is 1.1 kW.
- 11.1.16 Introduce the Deionized water into the plasma by turning the SAMPLE gas toggle switch back ON, slowly.
- 11.1.17 Allow the instrument to warm up for 45 to 60 minutes before optimizing the plasma conditions. (profiling)

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11.2 PROFILING

11.2.1. Manual or automatic profile must be done after the spectrometer warms up.

NOTE: AUTOMATIC PROFILE SHOULD BE USED FIRST. IF THERE IS A POSITION SHIFT OR A PEAK POSITION WHICH IS NOT BETWEEN -0.2 AND +0.2, THEN A MANUAL PROFILE SHOULD BE PERFORMED.

- 11.2.2 For Automatic Profile: on the computer, start from <Main Menu>. If you are not in <Main Menu>, press simultaneously <Ctrl> and <F9>.
- 11.2.3. Press <0> for operation, then <P> for profile. This will bring up the automatic profile menu.
- 11.2.4 Press <F3> for automatic profile. You will see the following as shown below:

Profile line: Hg 5460.74

Flush Time: 0 seconds

Preintegration Time: 0 seconds

Integration Time: 0.2 seconds

- Open the access door (See TJA OPERATOR'S MANUAL Figure 7-4) and move the shutter control to the LEFT position (marked "Hg").
- 11.2.6 While holding the shutter open, press <F1> to run. The upper left corner of the screen will display the word <scanning>.
- 11.2.7 When the <scanning> is done, close the shutter. The shutter must stay open during the scanning.
- 11.2.8 If the shift is zero and peak position is between -0.2 and +0.2, press <F9> to end, as per Section IV in TJA OPERATOR'S MANUAL. If not, press <F1> Calc SS the <ENTER> to get new vernian position. Set the vernian to that number and repeat the Profile and <F9> twice to save.

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- 11.2.9 For manual profile: press <Fl> to run. Full directions will be displayed on the screen for carrying out the profiling function. Open the "Hg" shutter and keep it open while adjusting the micrometer. Carefully turn the micrometer screw in the direction as specified in the instructions which appear on the screen. The micrometers used on the air and vacuum systems are shown schematically in TJA OPERATOR'S MANUAL Figure 7-4.
- 11.2.10 After completing the screen instructions, press <F9> to end.
- 11.2.11 Press <P> and repeat Steps for "automatic profile."

11.3 DAILY SHUTOFF

- 11.3.1 Push RF OFF button.
- 11.3.2 Turn POWER knob all the way counterclockwise.
- 11.3.3 Turn POWER CONTROL switch from AUTOMATIC to MANUAL.
- 11.3.4 Turn peristaltic pump OFF. Take tubing out of pump and also out of solvent.
- 11.3.5 Turn AUXILIARY and SAMPLE gas toggle switches OFF.
- 11.3.6 Wait for 3 minutes to let the torch cool and then turn TORCH switch OFF.
- 11.3.7 Turn the main valves for the nitrogen and argon OFF.
- 11.3.8 Turn coolant water OFF.

11.4 SHUTOFF FOR POWER OUTAGE

- 11.4.1 Perform normal shut-off procedure.
- 11.4.2 Turn high voltage switch located on the back of instrument to the OFF position.
- 11.4.3 Turn CONTROL and BREAKER switches OFF.

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11.5 OPTIMIZATION

This is a trial and error method to determine the best physical parameters of torch height, torch horizontal position, sample gas flow rates, argon gas flow, and R.F. Generator power. Optimization is focused on the entrance slit with minimum noise. The resultant signal will thus give you the best possible analytical data.

11.5.1 HORIZONTAL OPTIMIZATION

NOTE: For optimization, intensity is used so there is no need to standardize.

First, perform a regular profile. Use any element except Hg. The recommended element is Cd at a concentration of approximately 1 ppm. (It gives a sharp peak.)

Aspirate metal standard into the plasma.

Enter <Profile> and select the optimization element and wavelength as the Profile Element. Select <MANUAL PROFILE> to connect the element channel to the spectrometer front panel meter. Using the HORIZONTAL adjustment micrometer (the bottom knob at the side door, shown in TJA OPERATOR'S MANUAL Figure 8-4, move the image across the entrance slit to produce the maximum reading on the Profile Meter.

Press <Esc> to exit from profile.

11.5.2 FLOW RATE OPTIMIZATION -

NOTE: The flow rate is not required to be readjusted often.

It is related to the observation height. In this method, readjustment is necessary only after the height of the torch has been changed.

- a. Create a simple method in the method development selecting the Cd element, if you do not already have a optimization method. Change the concentration to intensity during the method setup.
- b. Profile the instrument and standardize with the new method.

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- c. Using the sample flow controller adjust the flow with the flow meter ball at 0.5 LPM and aspirate the 1 ppm Cd solution. Run like a normal sample. Record the signal and %RSD (should be around 1%). In the same way analyze a blank and record the background reading and %RSD.
- d. Determine the signal to background ratio (SBR) by dividing the result of Cd by the blank.
- e. Increase the flow to 0.55 LPM and run both the Cd and blank again recording the results. Calculate the SBR again.
- f. Keep on increasing the flow and analyzing the Cd and blank until the SBR begins to drop. The purpose is to determine the maximum SBR.
- g. This same procedure can be used for the other parameters listed above in the general information on optimization.
- 11.5.3 OPTIMIZATION OF YITRIUM TONGUE Set the forward power to 1.1 KW. Aspirate 1000 ppm of yttrium and observe the plasma. Adjust the gas flow to the nebulizer using the knob below the flowmeter marked "Sample" until the tip of the red yttrium oxide emission is between 1 and 2 mm above the top of the torch, and the blue ionic/atomic emission is above the torch. The following figure illustrates this.

12. CALCULATION

12.1 The results are automatically calculated and the final report is printed by the computer.

If for any reason a different sample weight and dilution factor have to be used and not entered into the sample information table, then ppm can be calculated as follows:

mg/L of each metal = Concentration x Final Volume
Sample Weight

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13. REFERENCES

- 13.1 Thermo Jarrell Ash ICAP 61 Operator's Manual.
- 13.2 Inductively Coupled Plasma Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes Methods 200.7 (EPA)
- 13.3 Inductively Coupled Plasma-Atomic Emission Spectroscopy, Method 6010, EPA Test Methods for Evaluating Solid Waste, Volume 1A: Laboratory Manual Physical/Chemical Methods

TABLE 1

LIST OF ELEMENTS ANALYZED BY THIS METHOD ALONG WITH WAVELENGTHS AND ESTIMATED INSTRUMENTAL PERFORMANCE LIMITS

Analytical Range Low High **Element** Wavelength Low Limit High Limit 50 X Dil. 50 X Dil. MDL <u>(nm)</u> (mgg) (mqq) (mgg) (mag) (2) (1)(2,3)(1)(3)0.003 Ag 300 328.07 0.15 15,000 Al 1000 1.25 308.22 0.025 50,000 2.50 As 193.70 0.050 1000 50,000 Ba 0.001 0.05 493.41 200 10,000 Be 313.04 0.001 150 0.05 7,500 Ca 0.001 50 0.05 2,500 393.37 Ca 317.93 0.010 1000 0.50 50,000 Cd 226.50 0.004 250 0.20 12,500 Cr0.005 500 0.25 25,000 267.72 Cu 0.002 300 0.10 15,000 324.75 Fe 259.94 0.005 500 0.25 25,000 Hg 184.96 0.020 1000 1.00 50,000 K 75,000 766.49 0.40 1500 20.0 279.08 Mg 0.015 1000 0.75 50,000 200 10,000 Mn 257.61 0.001 0.05 750 37,500 Mo 202.03 0.005 0.25 Na 589.00 0.010 500 0.50 25,000 Ni 231.60 0.010 750 0.50 37,500 Pb 220.35 0.025 1000 1.25 50,000 Sb 2.50 50,000 0.050 1000 206.83 Se 196.03 0.050 1000 2.50 50,000 Sn 189.99 0.015 1000 0.75 50,000 Тį 0.001 500 0.05 25,000 337.28 T1 377.57 0.100 1500 5.0 75,000 V 500 292.40 0.002 0.10 25,000 Zn 213.86 0.004 200 0.20 10,000

 $^{^{1}}$ High limit is the upper linear limit of the instrument. 2 Low limit is the lowest report value of the microwave digested samples. 3 In the sample digestate.

TABLE II

ANALYTE CONCENTRATION EQUIVALENTS ARISING FROM INTERFERENCE AT THE 100-mg/L LEVEL

Interferent											
	velength (nm)	Al	Ca	Cr	Cu	Fe	Mg	Mn	Ni	Tl	v
Aluminum	308.215							0.21			1.4
Antimony	206.833	0.47		2.9		0.08				0.25	0.4
Arsenic	193,696	1.3		0.44							1.1
Barium	455.403						~-				
Beryllium	313.042						~~			0.04	0.0
Cadmium	226.502					0.03			0.02		
Calcium	317.933	- -		0.08		0.01	0.01	0.04		0.03	0.0
Chromium	267.716					0.003		0.04			0.0
Cobalt	228.616			0.03		0.005			0.03	0.15	
Copper	324.754					0.003				0.05	0.0
Iron	259.940							0.12			
Lead	220.353	0.17									
Magnesium	279.079		0.02	0.11		0.13		0.25		0.07	0.1
Manganese	257.610	0.005		0.01		0.002	0.002				
Molybdenum	202.030	0.05				0.03					
Nickel	231.604										
Selenium	196.026	0.23				0.09	~-				
Sodium	588.995						~-			0.08	
Thallium	190.864	0.30					~-			~~	
Vanadium	292.402			0.05		0.005				0.02	
Zinc	213.856				0.14				0.29		

Dashes indicate that no interferences was observed even when interferents were introduced at the following levels:

A1 -	1000 mg/L	Mg - 1	1000 mg/L
Ca -	1000 mg/L	Mn -	200 mg/L
Cr -	200 mg/L	Tl -	200 mg/L
Cu -	200 mg/L	v -	200 mg/L
Fe -	1000 mg/L		

The figures recorded as analyte concentrations are not the actual observed concentrations; to obtain those figures, to obtain those figures, add the listed concentration to the interferent figure.

APPENDIX A DILUTION

HOW TO PRINT "SPECTROGRAPHIC LAB REPORT" FOR METAL CONTENT FROM ICAP SPECTROPHOTOMETER

After the microwave acid digestion (refer to Method #9501, SOP for MICROWAVE ACID DIGESTION OF WASTE MATERIALS FOR TOTAL METAL ANALYSIS) prepare a 50 x dilution and proceed as follows:

- 1. "Start-up" the spectrometer per normal procedure. (Refer to SOP #9711, ANALYSIS OF METALS IN ACID DIGESTED WASTE MATERIALS INDUCTIVELY COUPLED ARGON PLASMA-ATOMIC EMISSION SPECTROMETER).
- Aspirate and excite the sample. Soon after the excitation the results in ppm will be displayed on the monitor screen.

NOTE: THE 50 X DILUTION "FACTOR" IS ALREADY IN THE COMPUTER PROGRAM. THE PPM VALUES WILL BE MULTIPLIED BY THE COMPUTER AND THE RESULTS ON THE REPORTS WILL BE THE CALCULATED FINAL RESULTS.

(ONLY IF THE SAMPLES DO NOT HAVE TO BE DILUTED).

- 3. On the monitor, when a letter H (for high) or S (for saturated) does not appear along with the ppm, the Spectrographic Lab Reports could be used as such. If H or S appears along with any element, record the sample number and the element(s) in the log book. THESE SAMPLES MUST BE FURTHER DILUTED TO OBTAIN ACTUAL ppm RESULTS. Continue running the samples until all the samples are run within the calibrated range for each element.
- 4. When the letter H or S appears along with the ppm value for elements, <u>OTHER THAN</u> in the instances mentioned in paragraph 3, immediately, write down the sample number in the log book and the "Maximum Limit Value" for that element displayed at the bottom of the screen.

NOTE: THESE SAMPLES DO NOT HAVE TO BE DILUTED

5. After all the samples have been run, print the "Spectrographic Lab Reports" for each sample. The reports for samples where H or S had appeared will have blank spaces.

- 6. If the blank space is for element(s) <u>OTHER THAN</u> mentioned in paragraph 3, fill in the blank with "Maximum Limit Value" from paragraph 4 with a sign ">" (greater than); for example, >1000.
- 7. When the blank space is due to the elements mentioned in paragraph 3, that sample has to be further diluted.
- 8. The dilution could be prepared by using the <u>first</u> 50 X dilution which was prepared after Microwave Acid Digestion, for example:
 - An 8 X 50 dilution is $(8 \times 50) = 400 \times dilution$
- 9. The original computer program is for 50 X dilution. to change the macro program to 400, press simultaneously CONTROL and F3 and 400. Than follow paragraph 2.
- 10. If H or S does not appear on the screen with the $\mu g/mL$, print the report and use the $\mu g/mL$ values to fill in the blanks in the reports from paragraph 5. Otherwise, prepare another 8 X dilution (8 X 400 = 3200 X dilution) and repeat as in paragraph 9.
- 11. Continue analyzing the sample as in paragraph 7, 8, 9 and 10 until neither letters "H" nor "S" appear.
- 12. A data report (not the Spectrographic Lab Report) could also be printed for each sample, with H or S μ g/mL.

A P P E N D I X B

ANALYST TRAINING FORM

Trainee	Trainer_	
Date:	·	
Analysis: <u>ICAP</u>	Method: S	SK#9711
 The following section the trainer and under 		
	Trainer	Trainee
Scope & Application		·
Safety & Waste Handling		
Summary of Method		
Sample Handling & Pres.		
Interferences		
Apparatus		
Reagents		
Preventive Maint.		
Trouble Shooting /		
Corrective Action		
Quality Control		
Procedure		
Calculations		
References		
Attachments		
2. Trainee observed anal	ysis performed by Tra	iner:
3. Trainee repeats analy	sis. Comparative resu	ılts:
Sample ID Trainer	Results Train	ee Results
		
·		
Analyst certified to per	form method: (by/on)	
Additional training reco	mmended: (by/on)	
(Attach additional compa	rative results)	•

APPENDIX VII-C-2

INORGANIC ANALYSIS PROTOCOL METALS BY GRAPHITE FURNACE ATOMIC ABSORPTION SPECTROMETRY

SUPERSEDES: NEW PAGE: 1 OF 7

TITLE: STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF METALS BY

ZEEMAN GFAA.

(KEY WORDS: METALS, FLAME AA, DIGESTED)

(BASED ON: USEPA 7000)

1. SCOPE AND APPLICATION

1.1 This method is designed to determine metals in aqueous acid solutions using a Zeeman Graphite Furnace Atomic Absorption.

1.2 The metals covered in this method include:

Arsenic - As Thallium - Tl
Cadmium - Cd Beryllium - Be
Chromium - Cr Antimony - Sb
Lead - Pb Titanium - Ti
Silver - Aq

1.3 Other metals may be added if associated Quality Control requirements are established.

2. SAFETY AND WASTE HANDLING

2.1 EYE CONTACT - Handle concentrated acids in a fume hood with goggles.

EYE CONTACT - Goggles must be worn when working with the concentrated acids and the digested samples. Regular safety glasses with side shields do not provide adequate protection from an accidental sample splash.

2.2 HAND CONTACT - Handle concentrated acids in a fume hood with gloves.

HAND CONTACT - Use of disposable vinyl or latex gloves provide adequate protection from contact with the samples. All skin contact must be washed off immediately.

2.3 RESPIRATORY - Exposure to the vapors from the sample should be kept to a minimum by working in a well-ventilated area.

RESPIRATORY - Check the exhaust system to assure that it is working during the operation of the AA.

- 2.4 The energized source lamps and hot graphite furnace emits harmful ultraviolet and visible radiation. Care must be taken to avoid eye contact with such radiation.
- 2.5 Analyst must be aware of MSDS for all the chemicals used in the lab.

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2.6 WASTE DISPOSAL - The remainder of the sample in the original container must be returned to sample storage for future testing or later disposal.



WASTE DISPOSAL - The AA waste collection container must be made of plastic. If the waste solution has a pH of less than 5, neutralize it with 20% sodium carbonate solution.

WASTE DISPOSAL - Standards and aqueous samples are to be disposed of in the same manner as the AA waste.

WASTE DISPOSAL - Contaminated wipes must be placed in a metal container that has been lined with a plastic trash bag. A metal top must be kept on the container at all time except to add to or remove the contents.

2.7 TOXICS - Beryllium, cadmium, mercury, nickel, and lead are toxic and should be handled with care.

3. SUMMARY OF METHOD

- 3.1 The metals content of digested samples is determined by atomic absorption using Zeeman Graphite Furnace after digestion with Nitric Acid.
- 3.2 The analytical method used follows the SW-846 guidelines for the analysis of solid wastes.
- A representative aliquot of a sample is placed in the graphite tube in the furnace, evaporated to dryness, charred, and atomized. As a greater percentage of available analyte atoms is vaporized and dissociated for absorption in the tube rather than the flame, the use of smaller sample volumes or detection of lower concentrations of elements is possible. The principle is essentially the same as with direct aspiration atomic absorption, except that a furnace, rather than a flame, is used to atomize the sample. Radiation from a given excited element is passed through the vapor containing ground-state atoms of that element. The intensity of the transmitted radiation decreases in proportion to the amount of the ground-state element in the The metal atoms to be measured are placed in the beam of radiation by increasing the temperature of the furnace, thereby causing the injected specimen to be volatilized. A monochromator isolates the characteristic radiation from the hollow cathode lamp or electrodeless discharge lamp, and a photosensitive device measures the attenuated transmitted radiation.

SUPERSEDES: NEW PAGE: 3 OF 7

4. SAMPLE HANDLING AND PRESERVATION

4.1 Samples are aqueous acid digestions.

The sample is collected and stored in a disposable plastic container.

All aqueous samples are preserved with nitric acid to a pH of 2 or less.

- 4.2 A 10 mL specimen is required for each analysis.
- 4.3 The holding time for samples collected for metals analysis is 180 days.

5. INTERFERENCES

Matrix interferences are encountered frequently in GFAA. Excessive anions, high dissolved solids and high organics are common interferents. To correct for these interferents, several techniques are utilized.

- 5.1 MATRIX MODIFIERS Matrix modifiers are used for volatile elements to overcome matrix interference. See Attachment II for matrix modifiers used.
- 5.2 ANALYTE SPIKE Sample is spiked with a known concentration of analyte to determine if matrix effects are masking spike recovery.
- 5.3 BACKGROUND CORRECTION Varian GFAA utilizes Zeeman background correction technique to overcome matrix interference.

6. APPARATUS

- 6.1 Varian Atomic Absorption Spectrophotometer (See Attachment III)
- 6.2 Hollow Cathode Lamps (See Attachment III)
- 6.3 Exhaust hood.
- 6.4 Class A Volumetric flasks.
- 6.5 Eppendorf pipets.
- 6.6 Polyethylene wash bottles.
- 6.7 Glass volumetric pipettes.
- 6.8 Autosampler cups

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6.9 Pyrocoated graphite tubes and platforms.

7. REAGENTS/STANDARDS

7.1 Reagents

- 7.1.1 Nitric Acid Insta Analyzed (Trace Metal Grade)
- 7.1.2 Phosporic Acid Reagent Grade
- 7.1.3 Ammonium Dihydorgen Phosphate Reagent Grade
- 7.1.4 Ni(NO3)₂ 1000 ppm Solution
- 7.1.5 Deionized water Type II or equivalent.
- 7.1.6 Palladium 1000 ppm
- 7.1.7 Citric Acid
- 7.1.8 Ammonium Nitrate
- 7.1.9 Argon Commerical Grade

7.2 Standards

- 7.2.1 Stock Standard Solutions 1000 ppm certified single element standard solutions from two different sources used for calibration standard and calibration check standard expiration date one year.
- 7.2.2 Intermediate Stock Standards (primary standards) For all elements intermediate standards are prepared at 10 ppm. These standards are good for one week.
- 7.2.3 WORKING STANDARD SOLUTIONS Working Standard
 Solutions may be mixed or individual standards. They
 are prepared daily. All the standards are prepared
 in 5% HNO3. See Attachment II.

8. PREVENTIVE MAINTENANCE

- 8.1 Quartz windows and graphite contacts should be cleaned every day using methanol.
- 8.2 Syringe pump should be primed to get rid of all air bubbles.
- 8.3 Sample capillary should be aligned to make sure it deposits sample in the graphite tube.

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- 8.4 Fill the rinse bottle with water and 2 3 drops of concentrated HNO₃.
- 8.5 Check and empty AA waste bottle periodically.
- 8.6 Turn on the lamps and warm it for 30 minutes for Hollow Cathode lamp and 30 minutes for Super lamp.
- 8.7 Peak the HC lamp energy using two screws on the lamp. Peak the Super lamp energy using the power supply knob and 2 screws on the lamp.
- 8.8 Daily check the graphite tube and the platform.
- 8.9 Clean the outside of the capillary tip using 20% methanol everyday and rinse the inside of the capillary tip with aqua regia periodically.

9. TROUBLESHOOTING/CORRECTIVE ACTION

- 9.1 Low absorbance or no absorbance readings may be due to:
 - (a) bad graphite tube and or platform
 - (b) improper lamp alignment or bad lamp
 - (c) improper alignment of sample capillary tube

10. QUALITY CONTROL

- 10.1 REAGENTS All materials used as standards or reagents used to prepare standards or samples must be logged in and evaluated for suitability.
- 10.2 STANDARDS Standard preparations must be logged in and labeled as to contents and expiration date.
- 10.3 CALIBRATION Calibration curve must be prepared daily with a minimum of a reagent blank and three standards (see Attachment I for std. concentrations for each element), verified by use of a reagent blank and calibration check standard near mid-range. Checks must be within 10% of the true value. Run continuing calibration check standard every 10 samples. If calibration check standard is out of limit, the analysis is stopped, instrument is restandardized and set of samples before the bad QC are rerun. Beryllium initial calibration check should be within ± 10% and continuing check should be within ± 20% of the true value. Quadratic fit method is applied for the calibration curve using Varian software.

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- 10.4 Spike should be run with each matrix type to verify precision of the method. Spike duplicate should be run every twenty samples or per batch. Spike recovery should be within Safety-Kleen specified limits which is ± 3 SD of the mean % recovery value based on historical data. % RPD should be ± 20%. If spike recovery or % RPD are out of specified range rerun the sample. If still out of range redigest the sample and rerun. If spike recovery is below 50% run by method of standard addition. For oil samples if spike recovery is out of specified range rerun sample if recovery is still out of range run by standard addition.
- 10.5 Employ a minimum of one method blank per sample batch to determine any contamination from glasswares. Method blank values should be < PQL. If method blank shows analyte values above PQL, than all the samples in that batch showing analyte concentration above the reg limit should be redigested.
- 10.6 The method of standard additions shall be used if spike recoveries are below 50% and the concentration does not exceed the regulatory level or the concentration of the contaminant measured in the extract is within 20% of the regulatory level.
- 10.7 Dilute samples if they are more concentrated than the highest standard or if they fall on the plateau of a calibration curve.
- 10.8 Record the PMT volts and absorbance for daily run in the logbook.

11. PROCEDURE

START UP: Turn on the water recirculator, spectrAA-400 and Zeeman Unit. Turn on the Argon gas. Turn on the lamp by recalling the program for which analysis is required. Let it warm up for at least 15 - 30 minutes. Enter sample IDs for run sequence. Load the autosampler and start analysis.

SHUT DOWN: Turn off the Argon gas, Zeeman Unit, SpectrAA-400 Unit and water recirculator. Turn off the super lamp power supply if used for As/Se analysis.

- 11.1 INSTRUMENT CONDITIONS Instrument parameters for each element can be found in Attachment 1.
- 11.2 For detailed information on instrument operation refer to the instrument manual.

SUPERSEDES: NEW PAGE: 7 OF 7

12. CALCULATION

Results are calculated automatically based on standard curve. Final concentration is determined using this formula:

Conc. (ppm) =
$$\frac{\text{Sample Conc. (ppb) x Final Volume (mL)}}{\text{Sample Wt. (g)}} \times \frac{1}{1000}$$

13. REFERENCES

- 1. Varian 300/400 Zeeman Operation Manual and Analytical Methods Manual.
- Zeeman GFAA methods for environmental samples, Varian Instruments, June 1989, Number AA-90.

Attachment II

Element	SW-846 Method Reference	Wavelength (nm)	GFAA Method #	Modifier Used
As	7060	193.7	18,20 (low std) 17 (std add)	Ni (NO ₃) 2 1000 ppm
Cd	7131	228.8	13,28 (std add)	NH4 H2 PO4 - 1%
Cr	7191	520.8	24,25 (std add)	N/A
Pb	7421	283.3	9,12 (std add)	H ₃ PO ₄ - 1%
Se	7740	196.0	19,15 (std add) 16 (std add high)	
Ag	7761	328.1	3,2 (std add) 4 (low std) 30	N/A
Ве	7091	234.9	_	N/A
Tl	7841	276.8	26,27 (std add)	500 ppm pd + 2% Citric Acid
Sb	7041	217.6	5,6 (std add)	N/A
Ti	N/A	364.3	7	Hydroxylamine Hydro Chloride 2%
Working Ca	al Cal Chk		Platform	
Std Conc				·
(dqq)	(ppb)	Std Co	nc. Yes/No	
100	50	100	Y	
100	5	10		
100	50	100		
100	50	100	Y	
100	50	100,		
50	25	50		
10	5	N/A	Y (fork	ed tube)
50	25	50	Y	
100	50	100	Y	
500	250	N/A	N	•

Attachment III -

Atomic Absorption Varian Spectra 400 spectrophotometer with Zeeman graphite tube atomizer.

Varian Autosampler PSD 95/96

Photron super lamp power supply Hollow cathode lamps: bold phase

Arsenic				56-101003-00
Cadmium				56-101008-00
Chromium				56-101012-00
Lead				56-101029-00
Silver				56-101052-00
Beryllium				56-101224-00
Thallium				56-101058-00
Antimony				56-101221-00
Titanium	Varian	Part	No.:	56-101062-00

Super Lamps

Arsenic Varian Part No.: 56-101298-00 Selenium Varian Part No.: 56-101307-00

ATTACHMENT 1

Optimum concentration ranges: 0.05 - 5.0 mg/L at 234.9 nm.

A standard containing 1.5 mg/L beryllium should typically give an absorbance of about 0.200 at 234.9 nm.

INTERFERENCES

High concentrations of aluminum will depress the beryllium sensitivity and is overcome by the addition of 1% hydrofluoric acid.

Higher concentration of silicon and magnesium will also depress the beryllium absorbance values. These interferences are overcome by the addition of oxime (8-hydroxyquinoline) solution

GENERAL INSTRUMENT PARAMETERS

Instrument: Perkin Elmer Model 5000 or Wavelength: 234.9 nm Slit: 0.7 nm	5100 PC.
Light source: Beryllium hollow cathode	lamp.
Lamp current:	•
Fuel: Acetylene Pressure	Flow
Oxidant: Nitrous Oxide Pressure	Flow
Type of flame: Reducing (red feather)	
Instrument: Varian	
Wavelength: 234.9 nm	•
Slit: 1.0 nm	
Light source: Beryllium hollow cathode	lamp.
Lamp current: 5 ma	-
Fuel: Acetylene Pressure	Flow
Oxidant: Nitrous Oxide Pressure	Flow

Type of flame: Reducing (red feather)

Optimum concentration range: 0.05-2 mg/L at 228.8 nm. 1 - 100 mg/L at 326.1 nm.

A standard containing 1.5 mg/L cadmium should typically give an absorbance of about 0.200 at 228.8 nm.

INTERFERENCES

High concentrations of silicate will interfere in cadmium determination.

An ionization interference may occur if the samples have a significantly higher alkali metal content than the standard. By addition of potassium chloride to both samples and standards, ionization interference can be overcome.

GENERAL INSTRUMENT PARAMETERS

 Trabulanta Penkin Bluer Wedel 5000 as 5100 DO
Instrument: Perkin-Elmer Model 5000 or 5100 PC
Wavelength: 228.8 or 326.1 nm
Slit: 0.7 nm
Light Source: Cadmium hollow cathode lamp
Lamp current:
Fuel: Acetylene Pressure Flow
Oxidant: Air Pressure Flow
Type of flame: Oxidizing (lean, blue).
Instrument: Varian
Wavelength: 228.8 or 326.1 nm
Slit: 0.5 nm
Light Source: Cadmium hollow cathode lamp
Lamp current: 4 ma.
Fuel: Acetylene Pressure Flow
Oxidant: Air Pressure Flow

Type of flame: Oxidizing (lean, blue).

Optimum concentration range:

0.5 - 5 mg/L (0.5- 10 mg/L if N₂O - C₂H₂ flame is used) at 357.9 nm.

1 - 100 mg/L at 428.9 nm.

A standard containing 4 mg/L chromium should typically give an absorbance of about 0.200 at 357.9 nm.

INTERFERENCES

Iron and nickel will suppress the absorption of chromium. By using a lean blue flame, the interference can be lessened, but the sensitivity will also be reduced. The addition of 2% ammonium chloride to both sample and standard controls the interference caused by iron.

 ${\rm Cr}^{+6}$ and ${\rm Cr}^{+3}$ exhibit different sensitivities. If ${\rm CR}^{+3}$ is present in the sample, it is to be oxidized to ${\rm CR}^{+6}$.

Presence of excess phosphate in the sample will depress the chromium response and can be overcome by the addition of calcium.

By using nitrous oxide-acetylene flame, many chemical and/or matrix interferences can be reduced.

Instrument: Perkin Elmer Model 5000 or 5100 PC.
Wave length: 357.9 or 428.9 nm.
Slit: 0.7 nm
Light source: Chromium hollow cathode lamp.
Lamp current:
Fuel: Acetylene Pressure Flow
Oxidant: Air Pressure Flow
Type of flame: Oxidizing (lean, blue).
Instrument: Varian
Wave length: 357.9 or 428.9 nm
Slit: 0.5 nm.
Light source: Chromium hollow cathode lamp.
Lamp current: 7 ma.
Fuel: Acetylene Pressure Flow
Oxidant: Air Pressure Flow
Type of flame: Oxidizing (lean, blue).

Optimum concentration range: 0.2 - 5.0 mg/L at 324.7 nm

A standard containing 4 mg/L copper should typically give an absorbance of about 0.200 at 324.7 nm.

INTERFERENCES

With multi-element lamps containing nickel or iron, a 0.2 nm slit will be used with the copper 324.7 nm line.

Instrument: Perkin Elmer Model 5000 or 5100 PC. Wave length: 324.7 nm
Slit: 0.7 nm
Light source: Copper hollow cathode lamp.
Lamp current: Flow Flow
Oxidant: Air Pressure Flow
Type of flame: Oxidizing (lean, blue).
The sale of the sa
Instrument: Varian
Wave length: 324.7 nm
Slit: 0.5 nm.
Light source: Copper hollow cathode lamp.
Lamp current: 4 ma.
Fuel: Acetylene Pressure Flow
Oxidant: Air Pressure Flow
Type of flame: Oxidizing (lean, blue).

Optimum concentration range: 0.3 - 5.0 mg/L at 248.3 nm.

A standard containing 5 mg/L iron should typically give an absorbance of about 0.200.

INTERFERENCES

When iron is determined in the presence of cobalt, copper, or nickel, a reduction in sensitivity is observed. An excess of mineral acids will also reduce iron sensitivity, do to viscosity effects. These interferences can be controlled by using a very lean (blue) flame.

Silicon depresses the iron signal and can be overcome by the addition of 0.2% calcium chloride.

Some of the organic acids (particularly citric acid) may cause the reduction in the iron signal and can be eliminated by the addition of 0.5% phosphoric acid or sodium chloride.

By using nitrous oxide - acetylene flame, many of these interferences can be reduced or eliminated, but the sensitivity will be reduced.

Instrument: Perkin Elmer Model 5000 or 5100 PC.
Wave length: 248.3 nm (primary)
248.8, 271.9, 302.1, 252.7, or 372.0 nm (alternative)
Slit: 0.2 nm
Light source: Iron hollow cathode lamp.
Lamp current:
Fuel: Acetylene Pressure Flow
Oxidant: Air Pressure Flow
Type of flame: Oxidizing (lean, blue).
Background correction: May be required.
Instrument: Varian.
Wave length: 248.3 nm (primary)
248.8, 271.9, 302.1, 252.7, or 372.0 nm (alternative)
Slit: 0.2 nm.
Light source: Iron hollow cathode lamp.
Lamp current: 5 ma.
Fuel: Acetylene Pressure Flow
Oxidant: Air Pressure Flow
Type of flame: Oxidizing (lean, blue).
Background correction: May be required.

Optimum concentration range: 100 - 300 mg/L at 253.7 nm.

A standard containing 200 mg/L mercury should typically give an absorbance of about 0.200 at 253.7 nm.

INTERFERENCES

Large concentrations of cobalt will produce higher absorbance readings for mercury at the wave length line 253.7 nm.

Reducing agents like ascorbic acid, stannous chloride, etc., may reduce the mercury present to ${\rm Hg}^+$ or ${\rm Hg}^0$. These give higher sensitivities than ${\rm Hg}^{++}$ and their presence can give erroneously high results.

Instrument: Perkin Elmer Model 5000 or 5100 PC. Wave length: 253.7 nm Slit: 0.7 nm Light source: Mercury Electrodeless Discharge Lamp (EDL) (The sensitivity of mercury is 25% less for hollow cathode lamps.)
Lamp current:
Fuel: Acetylene Pressure Flow
Oxidant: Air Pressure Flow
Type of flame: Oxidizing (lean, blue).
Instrument: Varian
Wave length: 253.7 nm
Slit: 0.5 nm
Light source: Mercury Electrodeless Discharge Lamp (EDL) (The sensitivity of mercury is 25% less for hollow cathode
lamps.)
Lamp current: 4 ma.
Fuel: Acetylene Pressure Flow
Oxidant: Air Pressure Flow
Type of flame: Oxidizing (lean, blue).

Optimum concentration range: 0.3 - 5.0 mg/L at 232.0 nm.

A standard containing 7 mg/L nickel should typically give an absorbance of about 0.200.

INTERFERENCES

The presence of iron, cobalt or chromium may increase the nickel signal. This interference can be eliminated by either matrix matching or use of nitrous oxide/acetylene flame. However, this flame will reduce the nickel sensitivity.

A non-resonance line of Ni at 232.14 nm causes non-linear calibration curves at moderate to high nickel concentrations, requiring sample dilution or use of the 252.4 nm line.

Instrument: Perkin Elmer Model 50	000 or 5100 PC.
Wave length: 232.0 nm (primary); 3	352.4,341.5 (alternates).
Slit: 0.2 nm.	
Light source: Nickel hollow catho	ode lamp.
Lamp current:	<u>-</u>
Fuel: Acetylene Pressure	Flow
Oxidant: Air Pressure	Flow
Oxidant: Air Pressure Type of flame: Oxidizing (lean, h	olue).
Instrument: Varian.	
Wave length: 232.0 nm (primary); 3	352.4,341.5 (alternates).
Slit: 0.2 nm.	·
Light source: Nickel hollow catho	ode lamp.
Lamp current: 4 ma.	
Fuel: Acetylene	Pressure
Flow	<u> </u>
Oxidant: Air	Pressure
Flow	
Type of flame: Oxidizing (lean, b	olue).

Optimum concentration range: 1 - 20 mg/L at 283.3 nm.

20 mg/L Pb should give an absorbance of about 0.200 at 283.3 nm.

INTERFERENCES

Large excess of other elements may interfere with lead signal. (e.g., 10,000 mg/L Fe enhances the lead signal.)

With multi-element lamps containing copper, the Cu 216.5 nm resonance line may interfere with lead determinations at the lead 217.0 nm line. The lead 283.3 nm line must be used when a multiple-element lamp containing copper is used.

If the sample solution were to have been made with sulfuric acid, lead may precipitate out of solution. Nitric or hydrochloric acid is added to keep lead in solution.

Instrument: Perkin-Elmer Model 5000 or	
Wave length: 283.3 nm (alternate 217.0	nm)
Slit: 0.7 nm	
Light source: lead hollow cathode lamp) .
Lamp current:	
Fuel: Acetylene Pressure	Flow
Oxidant: Air Pressure	Flow
Type of flame: Oxidizing (lean, blue).	
Instrument: Varian.	
Wave length: 283.3 nm (alternate 217.0	nm)
Slit: 0.5 nm (1.0 nm for 217.0)	
Light source: lead hollow cathode lamp	•
Lamp current: 5 ma.	
Fuel: Acetylene Pressure	Flow
Oxidant: Air Pressure	Flow
Type of flame: Oxidizing (lean, blue).	

Optimum concentration range: 20-100 mg/L

A standard containing 80 mg/L titanium should typically give an absorbance of about 0.200 at 354.3 nm.

INTERFERENCES

The titanium absorption signal is increased by the presence of most metals (Al, Co, K, Mn, Na, Cu, Ca, Cr, Fe, Li, Mg, Mo, Cd, Sb, In, Ba, Ni, Sn, Sr, Pb, and V) P, F, and NH4+ at the concentrations above 500 mg/L.

Ionization of titanium should be controlled by the addition of an alkali salt (0.1% or more potassium as chloride) to samples and standards.

Instrument: Perkin Elmer Model 5000 or 5100 PC. Wave length: 364.3 nm Slit: 0.7 nm Light source: Titanium hollow cathode lamp.
Lamp current:
Fuel: Acetylene Pressure Flow
Oxidant: Air Pressure Flow
Type of flame: Oxidizing (lean, blue).
Instrument: Varian.
Wave length: 364.3 nm
Slit: 0.5 nm
Light source: Titanium hollow cathode lamp. Lamp current: 20 ma.
Fuel: Acetylene Pressure Flow
Oxidant: Air Pressure Flow
Type of flame: Oxidizing (lean, blue).

Optimum concentration range: 0.05 - 1.00 mg/L at 213.9 nm.

A standard containing 1.0 mg/L Zn should typically give an absorbance of about 0.200 at 213.9 nm.

INTERFERENCES

High levels of Si, Cu, or P04 may interfere. The addition of Strontium (1,500 mg/L) removes the copper and phosphate interference.

Instrument: Perkin Elmer Model 5000 or	5100 PC.
Wave length: 213.9 nm	
Slit: 0.7 nm	
Light source: zinc hollow cathode lamp) .
Lamp current:	
Fuel: Acetylene Pressure	Flow
Oxidant: Air Pressure	Flow
Type of flame: Oxidizing (lean, blue).	
Instrument: Varian.	
Wave length: 213.9 nm	
Slit: 1.0 nm	
Light source: zinc hollow cathode lamp	•
Lamp current: 5 ma.	
Fuel: Acetylene Pressure	Flow
Oxidant: Air Pressure	Flow
Type of flame: Oxidizing (lean, blue).	
Type of frame. Oxfarbing (feath, 21de).	

ATTACHMENT 2

PERKIN-ELMER ATOMIC ABSORPTION SYSTEMS

Atomic Absorption Spectrophotometer -

Perkin-Elmer 5000 or 5100 PC.

Hollow Cathode Lamps:

Beryllium P.E. Part No.

Cadmium P.E. Part No. N066-1299

Chromium P.E. Part No. N066-1297 for PE5100 or

P.E. Part No. 303-6021 for PE5000

Copper P.E. Part No. N066-1299

Iron P.E. Part No. N066-1298 for PE5100 or

P.E. Part No. 303-6037 for PE5000.

Nickle P.E. Part No. N066-1299

Lead P.E. Part No. N066-1299

Titanium P.E. Part No.

Zinc P.E. Part No. N066-1299

Electrodeless Discharge Lamp (EDL),

Mercury P.E. Part No. N066-1299

EDL power supply.

ATTACHMENT 2

VARIAN ATOMIC ABSORPTION SYSTEMS

Atomic Absorption Spectrophotometer -

Hollow Cathode Lamps:

Beryllium	Varian Part No.	
Cadmium	Varian Part No.	
Chromium	Varian Part No.	
Copper	Varian Part No.	
Iron	Varian Part No.	
Nickle	Varian Part No.	
Lead	Varian Part No.	
Titanium	Varian Part No.	
Zinc	Varian Part No.	

Electrodeless Discharge Lamp (EDL),

Mercury Varian Part No.

EDL power supply.

SAFETY-KLI TECHNICAL		DRAFT METHOD #: 970 REV: 10/9 SUPERSEDES: NE
ATTACHED :	IS A DOCUMENT FOR: CREATION	DATE: 9-29-9
TITLE:	STANDARD OPERATING PROCEDURE FOR IN AQUEOUS SOLUTIONS BY FLAME ATO SPECTROSCOPY (KEY WORDS: METALS, FLAME AA, DIG (BASED ON: USEPA 7000)	OMIC ABSORPTION
SERIES/SU	BJECT	
9000	Analytical Methods 9700	
COMMENTS:	-	
DEPARTMENT	r manager(s) -	
VICE PRESI	IDENT - TECHNICAL	· · · · · · · · · · · · · · · · · · ·

CLEENV WINDY CODE	DARAFT METHOD #: 9701
SAFETY-KLEEN CORP. TECHNICAL CENTER	REV: 10/91SUPERSEDES: NEW
IECHNICAL CENIER	SUPERBEDES: NEW
ATTACHED IS A DOCUMENT FOR: CREATION	DATE: 9-29-91
TITLE: STANDARD OPERATING PROCEDURE F IN AQUEOUS SOLUTIONS BY FLAME SPECTROSCOPY (KEY WORDS: METALS, FLAME AA, (BASED ON: USEPA 7000)	ATOMIC ABSORPTION
SERIES/SUBJECT	
9000 Analytical Methods 9700	
CONCURRENCES:	
DEPARTMENT MANAGER(S)	
VICE PRESIDENT - TECHNICAL	
DISTRIBUTION	
ARCHIVES	
VICE PRESIDENT - TECHNICAL	
DEPARTMENT MANAGER(S)	

ANALYST TRAINING FORM.

Trainee:			
Trainer:	Date:		
Analysis:	is: Method:		
1. The following sections of the trainer and understood		xplained by	
Scope & Application Safety & Waste Handling Summary of Method Sample Handling & Pres. Interferences Apparatus Reagents Preventive Maint. & Trouble Shooting / Corrective Action Quality Control Procedure Calculations References Attachments 2. Trainee observed analysis	Trainer	Trainee	
3. Trainee repeats analysis. Sample ID TRAINER RES	SULTS TRAINEE	RESULTS	
OTHER			
Analyst certified to perform	method: (by/on)		
Additional training recommen	ded: (by/on)		
(Attach additional comparati	ve results)		

PROGRAM 12 Pb STDADD

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	STANDARD ADDITIONS
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	4
LAMP CURRENT (mA)	5
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	283.3
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.40

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	150	20.0	3.0	NORMAL	NO
2	450	10.0	3.0	NORMAL	NO
3	600	15.0	3.0	NORMAL	NO
4	600	20.0	3.0	NORMAL	NO
5	600	2.0	0.0	NORMAL	ИО
6	2300	0.9	0.0	NORMAL	YES
7	2300	2.7	0.0	NORMAL	YES
8	2300	2.0	3.0	NORMAL	NO
9	40	11.6	3.0	NORMAL	МО

SAMPLER PARAMETERS VOLUMES (μ L)

	STANDARD	SAMPLE	BLANK	MODIFIER	
BLANK			20	5	
ADDITION 1	1	10	9	5	
ADDITION 2	2	10	8	- 5	
ADDITION 3	5	10	5	5	
SAMPLE		10	20	5	

		RE	CALIBRATION RATE	1		
MULTIPLE	INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
			TEMPERATURE	150		
	•		INJECT RATE	5		

QC STANDARD RATE	0
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.0 PPB
MATRIX SPIKE CONCENTRATION	1.0 PPB
INSTRUMENT DETECTION LIMIT	0.1 PPB
REOUIRED DETECTION LIMIT	7.4 PPB

PROGRAM 12 Pb STDADD
NO.1 BLANK REPLICATE 1
ABSORBANCE STANDARD ADDN'S SAMPLER AUTOMIX QC ZEEMAN

MAX.ABS. 1.40 BC ON PEAK AREA

STANDARDS

ADDITION 1 10.0 PPB

ADDITION 2 20.0 PPB

ADDITION 3 50.0 PPB

ADDITION 4

ADDITION 5

PROGRAM 30 Be

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	5
LAMP CURRENT (mA)	6
SLIT WIDTH (nm)	1.0
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	234.9
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.70

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	350	20.0	3.0	NORMAL	NO
2	1100	10.0	3.0	NORMAL	NO
3	1100	10.0	3.0	NORMAL	NO
4	1100	1.0	0.0	NORMAL	NO
5	2650	0.9	0.0	NORMAL	YES
6	2650	4.0	0.0	NORMAL	YES
7	2750	2.0	3.0	NORMAL	NO
8	40	13.6	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (μ L)

		SOLUTION	BLANK	MODIFIER	
BLANK ADDITION	1	2	10 8		
ADDITION	2	5	5		
ADDITION	3	10	0		
SAMPLE		10			

	- · -	CALIBRATION RATE SLOPE RATE	0 8		
MULTIPLE INJECT	NO	HOT INJECT TEMPERATURE INJECT RATE	YES 135 10	PRE INJECT	ИО

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	10
QC STANDARD CONCENTRATION	5.00 PPB
QC STANDARD LIMITS (%)	80 TO 120
QC SPIKE RATE	0
QC SPIKE VOLUME (μ L)	5
QC SPIKE CONCENTRATION	1.00 PPB
MATRIX SPIKE CONCENTRATION	1.00 PPB
INSTRUMENT DETECTION LIMIT	0.10 PPB
REQUIRED DETECTION LIMIT	0.26 PPB

PROGRAM 30 Be

QC ZEEMAN

BLANK ABSORBANCE REPLICATE 1

CONCENTRATION SAMPLER AUTOMIX

PEAK AREA MAX.ABS. 0.70 BC ON

STANDARDS

STANDARD 1 2.00 PPB

5.00 PPB STANDARD 2

STANDARD 3 10.00 PPB

STANDARD 4

STANDARD 5

PROGRAM 28 Cd STDADD

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	STANDARD ADDITIONS
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	7
LAMP CURRENT (mA)	4
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	228.8
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.70

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	350	20.0	3.0	NORMAL	МО
2	800	15.0	3.0	NORMAL	NO
3	800	10.0	3.0	NORMAL	ИО
4	800	2.0	0.2	NORMAL	ИО
5	2000	0.9	0.2	NORMAL	YES
6	2000	2.0	0.2	NORMAL	YES
7	2200	2.0	3.0	NORMAL	NO
8	40	10.8	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (µL)

	STANDARD	SAMPLE	BLANK	MODIFIER	
BLANK			20	6	
ADDITION 1	1	10	9	6	
ADDITION 2	2	10	8	6	
ADDITION 3	5	10	5	6	
SAMPLE		10	10	6	

		REC	CALIBRATION RATE	1		
MULTIPLE	INJECT	NO	HOT INJECT TEMPERATURE	YES 150	PRE INJECT	NO
			INJECT RATE	7		

QC STANDARD RATE	O :
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	5.00 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.00 PPB
MATRIX SPIKE CONCENTRATION	1.00 PPB
INSTRUMENT DETECTION LIMIT	1.00 PPB
REQUIRED DETECTION LIMIT	1.30 PPB

PROGRAM 28	Cd STDADD	QC	ZEEMAN
NO.1 BLANK	REPLICATE 1		
ABSORBANCE	STANDARD ADDN'S SAMPLER AUTOMIX		
PEAK AREA	MAX.ABS. 0.70 BC ON		

STANDARDS

ADDITION 5

ADDITION	1	1.00	PPB
ADDITION	2	2.00	PPB
ADDITION	3	5.00	PPB
ADDITION	4		

Sb LOWSTD (FOR PE SAMPLES)

PROGRAM 6

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	6
LAMP CURRENT (mA)	10
SLIT WIDTH (nm)	0.2
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	217.6
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.40

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	200	25.0	3.0	NORMAL	NO
2	350	20.0	3.0	NORMAL	NO
3	800	15.0	3.0	NORMAL	ИО
4	800	10.0	0.0	NORMAL	ИО
5	800	1.0	0.0	NORMAL	NO
6	2400	0.9	0.0	NORMAL	YES
7	2400	2.0	0.0	NORMAL	YES
8	2400	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (μ L)

	SOLUTION	BLANK	MODIFIER	
BLANK		20	10	
STANDARD 1 STANDARD 2	5 10	15 10	10 10	
STANDARD 3	20	0	10 10	
SAMPLE	20	U 		

RECALIBRATION RATE RESLOPE RATE			0 0		
MULTIPLE INJECT	NO	HOT INJECT TEMPERATURE INJECT RATE	YES 135 7	PRE INJECT	NO

QC STANDARD RATE	20	
QC INITIAL STANDARD POSITION	50	
QC INITIAL BLANK POSITION	51	
QC CONTINUING STANDARD POSITION	50	
QC CONTINUING BLANK POSITION	51	
QC STANDARD VOLUME (µL)	20	
QC STANDARD CONCENTRATION	10.00	PPB
QC STANDARD LIMITS (%)	90 TO	110
QC SPIKE RATE	4	
QC SPIKE VOLUME (µL)	5	
QC SPIKE CONCENTRATION	20.00	PPB
MATRIX SPIKE CONCENTRATION	25.00	PPB
INSTRUMENT DETECTION LIMIT	0.10	PPB
REQUIRED DETECTION LIMIT	1.00	PPB

QC ZEEMAN

PROGRAM 6 Sb LOWSTD REPLICATE 1

BLANK
ABSORBANCE CONCENTRATION SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 1.40 BC ON

STANDARDS

STANDARD 1 5.00 PPB

STANDARD 2 10.00 PPB

STANDARD 3 20.00 PPB

STANDARD 4

STANDARD 5

PROGRAM 5 Sb

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	6
LAMP CURRENT (mA)	10
SLIT WIDTH (nm)	0.2
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	217.6
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.40

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	200	25.0	3.0	NORMAL	NO
2	350	20.0	3.0	NORMAL	NO
3	800	15.0	3.0	NORMAL	NO
4	800	10.0	0.0	NORMAL	NO
5	800	1.0	0.0	NORMAL	NO
6	2400	0.9	0.0	NORMAL	YES
7	2400	2.0	0.0	NORMAL	YES
8	2400	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (μ L)

		SOLUTION	BLANK	MODIFIER	
BLANK STANDARD STANDARD STANDARD SAMPLE	2	 4 10 20 20	20 16 10 0	10 10 10 10 10	

			CALIBRATION RATE SLOPE RATE	0 0		
MULTIPLE	INJECT	ИО	HOT INJECT TEMPERATURE INJECT RATE	YES 135 7	PRE INJECT	NO

QC STANDARD RATE	20	
QC INITIAL STANDARD POSITION	50	
QC INITIAL BLANK POSITION	51	
QC CONTINUING STANDARD POSITION	50	
QC CONTINUING BLANK POSITION	51	
QC STANDARD VOLUME (µL)	20	
QC STANDARD CONCENTRATION	50.00	PPB
QC STANDARD LIMITS (%)	90 TO	110
QC SPIKE RATE	0	
QC SPIKE VOLUME (µL)	5	
QC SPIKE CONCENTRATION	100.00	PPB
MATRIX SPIKE CONCENTRATION	25.00	PPB
INSTRUMENT DETECTION LIMIT	0.1	PPB
REQUIRED DETECTION LIMIT	1.0	PPB

PROGRAM 5 Sb

QC ZEEMAN

BLANK

REPLICATE 1

ABSORBANCE

CONCENTRATION SAMPLER AUTOMIX

PEAK AREA

MAX.ABS. 1.40 BC ON

STANDARDS

STANDARD 1 20.0 PPB

STANDARD 2 50.0 PPB

STANDARD 3 100.0 PPB

STANDARD 4

STANDARD 5

PROGRAM 3 Ag

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	3
LAMP CURRENT (mA)	4
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	328.1
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.30

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	140	5.0	3.0	NORMAL	NO
2	220	50.0	3.0	NORMAL	NO
3	650	10.0	3.0	NORMAL	ИО
4	650	20.0	3.0	NORMAL	NO
5	650	1.0	0.3	NORMAL	NO
6	2400	1.5	0.3	NORMAL	YES
7	2400	2.0	0.3	NORMAL	YES
8	2400	2.0	3.0	NORMAL	NO
9	40	12.3	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (µL)

	SOLUTION	BLANK	MODIFIER	
BLANK STANDARD 1 STANDARD 2 STANDARD 3 SAMPLE	 4 10 20 20	20 16 10 0	***	

·		RECALIBRATION I RESLOPE RATE	RATE 0		
MULTIPLE IN	JECT NO	HOT INJECT TEMPERATUR INJECT RAT	E 135	PRE INJECT	NO

QC STANDARD RATE	20	
QC INITIAL STANDARD POSITION	50 .	
QC INITIAL BLANK POSITION	51	
QC CONTINUING STANDARD POSITION	50	
QC CONTINUING BLANK POSITION	51	
QC STANDARD VOLUME (µL)	20	
QC STANDARD CONCENTRATION	25.00	PPB
QC STANDARD LIMITS (%)	90 TO	110
QC SPIKE RATE	4	
QC SPIKE VOLUME (µL)	5	
QC SPIKE CONCENTRATION	50.00	PPB
MATRIX SPIKE CONCENTRATION	12.50	PPB
INSTRUMENT DETECTION LIMIT	0.10	PPB
REQUIRED DETECTION LIMIT	1.30	PPB

PROGRAM 3

QC ZEEMAN

BLANK

ABSORBANCE

Ag REPLICATE 1 CONCENTRATION SAMPLER AUTOMIX

PEAK AREA

MAX.ABS. 1.30 BC ON

STANDARDS

STANDARD 1 10.00

STANDARD 2 25.00

50.00 STANDARD 3

STANDARD 4

STANDARD 5

Ag LOWSTD

PROGRAM 4

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	3
LAMP CURRENT (mA)	4
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	328.1
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.30

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	140	5.0	3.0	NORMAL	NO
2	220	50.0	3.0	NORMAL	NO
3	650	10.0	3.0	NORMAL	NO
4	650	20.0	3.0	NORMAL	NO
5	650	1.0	0.3	NORMAL	NO
6	2400	1.5	0.3	NORMAL	YES
7	2400	2.0	0.3	NORMAL	YES
8	2400	2.0	3.0	NORMAL	NO
9	40	12.3	3.0	NORMAL	ИО

SAMPLER PARAMETERS VOLUMES (μ L)

		SOLUTION	BLANK	MODIFIER	
BLANK STANDARD STANDARD STANDARD	2	5 10 20	20 15 10 0		
SAMPLE		20	0		

			CALIBRATION RATE SLOPE RATE	0 0		
MULTIPLE	INJECT	ИО	HOT INJECT TEMPERATURE INJECT RATE	YES 135 7	PRE INJECT	МО

QC STANDARD RATE	20	
QC INITIAL STANDARD POSITION	50	
QC INITIAL BLANK POSITION	51	
QC CONTINUING STANDARD POSITION	50	
QC CONTINUING BLANK POSITION	51	
QC STANDARD VOLUME (µL)	20	
QC STANDARD CONCENTRATION	10.00	PPB
QC STANDARD LIMITS (%)	90 TO	110
QC SPÎKE RATE	0	
QC SPIKE VOLUME (µL)	5	
QC SPIKE CONCENTRATION	1.00	PPB
MATRIX SPIKE CONCENTRATION	0.00	PPB
INSTRUMENT DETECTION LIMIT	0.10	PPB
REQUIRED DETECTION LIMIT	0.10	PPB

PROGRAM 4 Ag LOWSTD

QC ZEEMAN

BLANK

REPLICATE 1

ABSORBANCE CONCENTRATION SAMPLER AUTOMIX

PEAK AREA MAX.ABS. 1.30 BC ON

STANDARDS

STANDARD 1 5.00

STANDARD 2 10.00

STANDARD 3 20.00

STANDARD 4

STANDARD 5

PROGRAM 13 Cd

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	7
LAMP CURRENT (mA)	4
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	228.8
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.70

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	350	20.0	3.0	NORMAL	NO
2	800	15.0	3.0	NORMAL	NO
3	800	10.0	3.0	NORMAL	NO
4	800	2.0	0.2	NORMAL	NO
5	2000	0.9	0.2	NORMAL	YES
6	2000	2.0	0.2	NORMAL	YES
7	2200	2.0	3.0	NORMAL	ИО
8	40	10.8	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER	
BLANK		20	6	
STANDARD 1	5	15	6	
STANDARD 2	10	10	6	
STANDARD 3	20	0	6	
SAMPLE	20	0	6	

			ALIBRATION RATE LOPE RATE	0		
MULTIPLE	INJECT	NO	HOT INJECT TEMPERATURE INJECT RATE	YES 150 7	PŘE INJECT	NO

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
• • • • • • • • • • • • • • • • • • • •	5.00
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	Ö
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	10.00
MATRIX SPIKE CONCENTRATION	2.50
INSTRUMENT DETECTION LIMIT	0.10
REQUIRED DETECTION LIMIT	1.30

PROGRAM 13 Cd

QC ZEEMAN

BLANK REPLICATE 1

ABSORBANCE CONCENTRATION SAMPLER AUTOMIX

PEAK AREA

MAX.ABS. 0.70 BC ON

STANDARDS

STANDARD 1 2.50

STANDARD 2 5.00

STANDARD 3 10.00

STANDARD 4

STANDARD 5

PROGRAM 7

· · · · · · · · · · · · · · · · · · ·	
INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	6
LAMP CURRENT (mA)	20
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	REDUCED
WAVELENGTH (nm)	364.3
SAMPLE INTRODUCTION	SAMPLER PREMIXED
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.90

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	95	10.0	3.0	NORMAL	МО
2	120	5.0	3.0	NORMAL	NO
3	1500	20.0	3.0	NORMAL	NO
4	1500	3.0	3.0	NORMAL	NO
5	1500	1.0	0.0	NORMAL	ИО
6	2900	0.9	0.0	NORMAL	YES
7	2900	2.0	0.0	NORMAL	YES
8	2900	3.0	3.0	NORMAL	ИО

SAMPLER PARAMETERS VOLUMES (µL)

	SOLUTION	BLANK	MODIFIER	
BLANK STANDARD 1 STANDARD 2 STANDARD 3 SAMPLE	 5 5 5 5 5	5 0 0 0 0	2 2 2 2 2 2 2	

RECALIBRATION RAY	re o
RESLOPE RATE	0

MULTIPLE INJECT NO HOT INJECT NO PRE INJECT YES
LAST DRY STEP 2

PROGRAM 7

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	5
QC STANDARD CONCENTRATION	100.0
QC STANDARD LIMITS (%)	80 TO 120
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.0
MATRIX SPIKE CONCENTRATION	1.0
INSTRUMENT DETECTION LIMIT	0.1
REQUIRED DETECTION LIMIT	1.0

PROGRAM 7 Ti QC ZEEMAN

BLANK REPLICATE 1

ABSORBANCE CONCENTRATION SAMPLER PREMIX

PEAK AREA MAX.ABS. 1.90 BC ON

STANDARDS

STANDARD 1 50.0

STANDARD 2 100.0

STANDARD 3 200.0

STANDARD 4

STANDARD 5

PROGRAM 9 Pb

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	4
LAMP CURRENT (mA)	5
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	283.3
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.40

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	150	20.0	3.0	NORMAL	NO
2	450	10.0	3.0	NORMAL	NO
3	600	15.0	3.0	NORMAL	NO
4	600	20.0	3.0	NORMAL	NO
5	600	2.0	0.0	NORMAL	ЙО
6	2300	0.9	0.0	NORMAL	YES
7	2300	2.7	0.0	NORMAL	YES
8	2300	2.0	3.0	NORMAL	NO
9	40	11.6	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (μ L)

	SOLUTION	BLANK	MODIFIER	
BLANK		20	6	
STANDARD 1	2	18	6	
STANDARD 2	10	10	6	
STANDARD 3	20	0	6	
SAMPLE	20	0	6	

			CALIBRATION RATE SLOPE RATE	0		
MULTIPLE	INJECT	ИО	HOT INJECT TEMPERATURE INJECT RATE	YES 150 5	PRE INJECT	ИО

PROGRAM 9

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	100.0
MATRIX SPIKE CONCENTRATION	25.0
INSTRUMENT DETECTION LIMIT	0.1
REQUIRED DETECTION LIMIT	7.4

PROGRAM 9 Pb

QC ZEEMAN

BLANK REPLICATE 1
ABSORBANCE CONCENTRATION SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 1.40 BC ON

STANDARDS

STANDARD 1 10.0

STANDARD 2 50.0

STANDARD 3 100.0

STANDARD 4

STANDARD 5

PROGRAM 15 Se STDADD

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	STANDARD ADDITIONS
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	1
LAMP CURRENT (mA)	6
SLIT WIDTH (nm)	1.0
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	196.0
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.20

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	220	15.0	3.0	NORMAL	МО
2	220	10.0	3.0	NORMAL	ИО
3	550	10.0	3.0	NORMAL	NO
4	1200	15.0	3.0	NORMAL	NO
5	1200	10.0	0.0	NORMAL	NO
6	2500	0.7	0.0	NORMAL	YES
7	2500	2.7	0.0	NORMAL	YES
8	2500	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (μ L)

	STANDARD	SAMPLE	BLANK	MODIFIER	
BLANK		~-	20	12	
ADDITION 1	2	10	8	12	
ADDITION 2	5	10	5	12	
ADDITION 3	10	10	0	12	
SAMPLE		10	10	12	

RECALIBRATION RATE 1

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	135		
		INJECT RATE	10		

QC STANDARD RATE	0
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.0 PPB
MATRIX SPIKE CONCENTRATION	1.0 PPB
INSTRUMENT DETECTION LIMIT	0.1 PPB
REQUIRED DETECTION LIMIT	7.2 PPB

PROGRAM 15 Se STDADD NO.1 BLANK REPLICATE 1 QC ZEEMAN

ABSORBANCE STANDARD ADDN'S SAMPLER AUTOMIX

PEAK AREA MAX.ABS. 1.20 BC ON

STANDARDS

ADDITION 1 20.0 PPB

ADDITION 2 50.0 PPB

ADDITION 3 100.0 PPB

ADDITION 4

ADDITION 5

PROGRAM 16

Se STDADD HIGH

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	STANDARD ADDITIONS
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	1
LAMP CURRENT (mA)	6
SLIT WIDTH (nm)	1.0
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	196.0
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.20

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	220	15.0	3.0	NORMAL	ио
2	220	30.0	3.0	NORMAL	NO
3	550	10.0	3.0	NORMAL	NO
4	1200	15.0	3.0	NORMAL	NO
5	1200	10.0	0.0	NORMAL	NO
6	2500	0.7	0.0	NORMAL	YES
7	2500	2.7	0.0	NORMAL	YES
8	2500	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (μL)

	STANDARD	SAMPLE	BLANK	MODIFIER	
BLANK ADDITION 1	 2	 10	20 8	12 12	
ADDITION 2	5	10	5	12	
ADDITION 3 SAMPLE	10 	10 10	10	12 12	

RECALIBRATION RATE 1

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	МО
		TEMPERATURE	135		
		INJECT RATE	10		

QC STANDARD RATE	0
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (μL)	5
QC SPIKE CONCENTRATION	1.0 PPB
MATRIX SPIKE CONCENTRATION	1.0 PPB
INSTRUMENT DETECTION LIMIT	0.1 PPB
REQUIRED DETECTION LIMIT	7.2 PPB

PROGRAM 16 Se STDADD HIGH NO.1 BLANK REPLICATE 1 QC ZEEMAN

ABSORBANCE STANDARD ADDN'S SAMPLER AUTOMIX

PEAK AREA MAX.ABS. 1.20 BC ON

STANDARDS

ADDITION 1 100.0 PPB

ADDITION 2 250.0 PPB

ADDITION 3 500.0 PPB

ADDITION 4

ADDITION 5

PROGRAM 17 As STDADD

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	STANDARD ADDITIONS
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	1
LAMP CURRENT (mA)	10
SLIT WIDTH (nm)	0.2
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	193.7
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.95

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GÀS TYPE	READ COMMAND
1	350	20.0	3.0	NORMAL	МО
2	600	15.0	3.0	NORMAL	ИО
3	1300	10.0	3.0	NORMAL	NO
4	1300	10.0	3.0	NORMAL	ИО
5	1300	1.0	0.0	NORMAL	NO
6	2600	0.7	0.0	NORMAL	YES
7	2600	2.7	0.0	NORMAL	YES
8	2600	2.0	3.0	NORMAL	ЙO

SAMPLER PARAMETERS VOLUMES (µL)

	STANDARD	SAMPLE	BLANK	MODIFIER	
BLANK			20	5	
ADDITION 1	2	10	8	5	
ADDITION 2	5	10	5	5	
ADDITION 3	10	10	0	5	
SAMPLE		10	10	5	

		RECA	LIBRATION RATE	1			
MULTIPLE	INJECT		HOT INJECT TEMPERATURE INJECT RATE	YES 150 7	PRE	INJECT	ИО

QC STANDARD RATE	0
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (μL)	5
QC STANDARD CONCENTRATION	1.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.0 PPB
MATRIX SPIKE CONCENTRATION	1.0 PPB
INSTRUMENT DETECTION LIMIT	0.1 PPB
REQUIRED DETECTION LIMIT	1.0 PPB

PROGRAM 17 AS STDADD NO.1 BLANK REPLICATE 1

QC ZEEMAN

ABSORBANCE

STANDARD ADDN'S SAMPLER AUTOMIX

PEAK AREA MAX.ABS. 0.95 BC ON

STANDARDS

ADDITION 1 20.0 PPB

ADDITION 2 50.0 PPB

ADDITION 3 100.0 PPB

ADDITION 4

ADDITION 5

PROGRAM 18 As

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	1
LAMP CURRENT (mA)	15
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	193.7
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.95

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	300	30.0	3.0	NORMAL	NO
2	600	15.0	3.0	NORMAL	NO
3	1300	10.0	3.0	NORMAL	NO
4	1300	10.0	3.0	NORMAL	NO
5	1300	2.0	0.0	NORMAL	NO
6	2600	0.7	0.0	NORMAL	YES
7	2600	2.7	0.0	NORMAL	YES
8	2600	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (μ L)

	SOLUTION	BLANK	MODIFIER	
BLANK		20	6	
STANDARD 1	4	16	6	
STANDARD 2	10	10	6	
STANDARD 3	20	0	6	
SAMPLE	20	0	6	

		RECALIBRATION RATE RESLOPE RATE	0		
MULTIPLE INJ	ECT NO	HOT INJECT TEMPERATURE INJECT RATE	YES 150 7	PRE INJECT	NO

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	100.0
MATRIX SPIKE CONCENTRATION	25.0
INSTRUMENT DETECTION LIMIT	0.1
REQUIRED DETECTION LIMIT	15.5

PROGRAM 18 As

QC ZEEMAN

BLANK

REPLICATE 1

ABSORBANCE CONCENTRATION SAMPLER AUTOMIX

PEAK AREA MAX.ABS. 0.95 BC ON

STANDARDS

STANDARD 1 20.0

50.0 STANDARD 2

STANDARD 3 100.0

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 19 Se

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	1
LAMP CURRENT (mA)	6
SLIT WIDTH (nm)	1.0
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	196.0
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.20

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	220	15.0	3.0	NORMAL	МО
2	220	10.0	3.0	NORMAL	NO
3	550	10.0	3.0	NORMAL	МО
4	1200	15.0	3.0	NORMAL	NО
5	1200	1.0	0.0	NORMAL	NO
6	2500	0.7	0.0	NORMAL	YES
7	2500	2.7	0.0	NORMAL	YES
8	2500	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (μL)

BLANK 20 10 STANDARD 1 4 16 10 STANDARD 2 10 10 10 STANDARD 3 20 0 10 SAMPLE 20 0 10	

			CALIBRATION RATE SLOPE RATE	0 0		
MULTIPLE I	INJECT	NO	HOT INJECT TEMPERATURE INJECT RATE	YES 135 10	PRE INJECT	NO

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	100.0
MATRIX SPIKE CONCENTRATION	25.0
INSTRUMENT DETECTION LIMIT	1.0
REQUIRED DETECTION LIMIT	7.2

PROGRAM 19 Se

QC ZEEMAN

BLANK

REPLICATE 1

ABSORBANCE

CONCENTRATION SAMPLER AUTOMIX

PEAK AREA

MAX.ABS. 1.20 BC ON

STANDARDS

STANDARD 1 20.0

50.0 STANDARD 2

STANDARD 3 100.0

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 20 ASLOWSTD

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	1
LAMP CURRENT (mA)	15
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	193.7
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2 .
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.95

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	300	30.0	3.0	NORMAL	МО
2	600	15.0	3.0	NORMAL	NO
3	1300	10.0	3.0	NORMAL	NO
4	1300	10.0	3.0	NORMAL	NO
5	1300	2.0	0.0	NORMAL	ИО
6	2600	0.7	0.0	NORMAL	YES
7	2600	2.7	0.0	NORMAL	YES
8	2600	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (μL)

SOLUTI	ON BLANK	MODIFIER	
BLANK	20	6	
STANDARD 1 5	15	6	
STANDARD 2 10	10	6	
STANDARD 3 20	0	6	
SAMPLE 20	. 0	6	

		CALIBRATION RATE SLOPE RATE	0 0		
MULTIPLE INJECT	МО	HOT INJECT TEMPERATURE INJECT RATE	YES 150 7	PRE INJECT	NO

QC ZEEMAN

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
	10.0
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	100.0
MATRIX SPIKE CONCENTRATION	25.0
INSTRUMENT DETECTION LIMIT	0.1
REQUIRED DETECTION LIMIT	0.5

PROGRAM 20 As LOWSTD
BLANK REPLICATE 1 MULTIPLE 1

ABSORBANCE CONCENTRATION SAMPLER AUTOMIX

PEAK AREA MAX.ABS. 0.95 BC ON

STANDARDS

STANDARD 1 5.0

STANDARD 2 10.0

STANDARD 3 20.0

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 20 Cr

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	8
LAMP CURRENT (mA)	7
SLIT WIDTH (nm)	0.2
SLIT HEIGHT	REDUCED
WAVELENGTH (nm)	429.0
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	2.00

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLÖW (L/min)	GAS TYPE	READ COMMAND
1	85	40.0	3.0	NORMAL	ИО
2	120	10.0	3.0	NORMAL	NO
3	1000	5.0	3.0	NORMAL	NO
4	1000	1.0	3.0	NORMAL	NO
5	1000	2.0	0.0	NORMAL	NO
6	2600	0.8	0.0	NORMAL	YES
7	2600	2.0	0.0	NORMAL	YES
8	2600	2.0	3.0	NORMAL	ИО

SAMPLER PARAMETERS VOLUMES (μL)

	SOLUTION	BLANK	MODIFIĒR	
BLANK	-	10		
STANDARD 1	2	8		
STANDARD 2	5	5		
STANDARD 3	10	0		
SAMPLE	10	0		

MULTIPLE	INJECT	CALIBRATION RATE SLOPE RATE HOT INJECT TEMPERATURE INJECT RATE	YES 85 5	PRE INJECT	МО

QC STANDARD RATE	20 .
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	10
QC STANDARD CONCENTRATION	50.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	100.0 PPB
MATRIX SPIKE CONCENTRATION	25.0 PPB
INSTRUMENT DETECTION LIMIT	0.1 PPB
REQUIRED DETECTION LIMIT	5.7 PPB

PROGRAM 24 Cr

QC ZEEMAN

REPLICATE 1

ABSORBANCE PEAK AREA

CONCENTRATION SAMPLER AUTOMIX

MAX.ABS. 2.00 BC ON

STANDARDS

STANDARD 1 20.0 PPB

STANDARD 2 50.0 PPB

STANDARD 3 100.0 PPB

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 25 Cr STDADD

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	STANDARD ADDITIONS
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	8
LAMP CURRENT (mA)	7
SLIT WIDTH (nm)	0.2
SLIT HEIGHT	REDUCED
WAVELENGTH (nm)	429.0
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	2.00

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	85	40.0	3.0	NORMAL	МО
2	120	10.0	3.0	NORMAL	NO
3	1100	5.0	3.0	NORMAL	NO
4	1100	1.0	3.0	NORMAL	NO
5	1100	2.0	0.0	NORMAL	NO
6	2700	0.8	0.0	NORMAL	YES
7	2700	2.0	0.0	NORMAL	YES
8	2900	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (µL)

	STANDARD	SAMPLE	BLANK	MODIFIER	
BLANK ADDITION 1 ADDITION 2 ADDITION 3 SAMPLE	 2 5 10	 10 10 10 10	20 8 5 0		

RECALIBRATION RATE 1

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	МО
		TEMPERATURE	85		
		TNJECT RATE	5		

Cr STDADD (continued)

QA PROTOCOL PARAMETERS

QC STANDARD RATE	0
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	5
QC STANDARD CONCENTRATION	1.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.0 PPB
MATRIX SPIKE CONCENTRATION	1.0 PPB
INSTRUMENT DETECTION LIMIT	1.0 PPB
REOUIRED DETECTION LIMIT	1.0 PPB

PROGRAM 25	Cr STDADD	QC	ZEEMAN
NO.1 BLANK	REPLICATE 1		

ABSORBANCE STANDARD ADDN'S SAMPLER AUTOMIX PEAK AREA MAX.ABS. 2.00 BC ON

STANDARDS

ADD	ΣΤΤΤΟΝ 1	10.0	PPR

ADDITION 2 25.0 PPB

ADDITION 3 50.0 PPB

ADDITION 4

ADDITION 5

PROGRAM 26 Tl

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	6
LAMP CURRENT (mA)	12
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	276.8
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.55

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	250	30.0	3.0	NORMAL	МО
2	1000	20.0	3.0	NORMAL	NO
3	1000	15.0	3.0	NORMAL	NO
4	1000	1.0	0.0	NORMAL	NO
5	2400	0.8	0.0	NORMAL	YES
6	2400	2.0	0.0	NORMAL	YES
7	2400	2.0	3.0	NORMAL	NO
8	40	12.3	3.0	NORMAL	NO

SAMPLER PARAMETERS VOLUMES (μL)

SC	LUTION	BLANK	MODIFIER
BLANK STANDARD 1 STANDARD 2 STANDARD 3 SAMPLE	 4 10 20 20	20 16 10 0	8 8 8 8 8 5

•			LIBRATION RATE	0 0			
MULTIPLE	INJECT	ИО	HOT INJECT TEMPERATURE INJECT RATE	YES 150 10	PRE	INJECT	МО

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	100.0 PPB
MATRIX SPIKE CONCENTRATION	25.0 PPB
INSTRUMENT DETECTION LIMIT	0.1 PPB
REQUIRED DETECTION LIMIT	2.8 PPB

PROGRAM 26 T1

QC ZEEMAN

BLANK

REPLICATE 1

ABSORBANCE

CONCENTRATION SAMPLER AUTOMIX

PEAK AREA

MAX.ABS. 0.55 BC ON

STANDARDS

STANDARD 1 20.0 PPB

STANDARD 2 50.0 PPB

STANDARD 3 100.0 PPB

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

APPENDIX VII-C-3

ORGANIC ANALYSES PROTOCOL

GAS CHROMATOGRAPHY/ MASS SPECTROMETRY (GC/MS)
ANALYSIS OF VOLATILE ORGANIC COMPOUNDS

METHOD #: 19203 REV: 12/93

SUPERSEDES: NEW

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TITLE:

STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF TCLP VOLATILE

ORGANIC COMPOUNDS

(BASED ON: EPA METHOD 8240)

(KEY WORDS: VOLATILE, ORGANICS, GC/MS, TCLP)

SCOPE AND APPLICATION

1.1 This method is used to determine volatile organic compounds in a variety of solid waste matrices. This method is applicable to nearly all types of samples, regardless of water content, including ground water, aqueous sludges, caustic liquors, acid liquors, waste solvents, oily wastes, mousses, tars, fibrous wastes, polymeric emulsions, filter cakes, spent catalysts, soils, and sediments.

- 1.2 Method 8240 can be used to quantify most volatile organic compounds that have boiling points below 200°C and that are insoluble or slightly soluble in water. Volatile water-soluble compounds can be included in this analytical technique, however, for the more soluble compounds, quantitation limits are approximately ten times higher because of poor purging efficiency. The method is also limited to compounds that elute as sharp peaks from a capillary GC column. Such compounds include low-molecular-weight halogenated hydrocarbons, aromatics, ketones, nitriles, acetates, acrylates, ethers, and sulfides. See Table 1 for a list of compounds, retention times, and their characteristic ions that have been evaluated on a purge-and trap GC/MS system.
- 1.3 The Practical Quantitation Limit (PQL) of Method 8240 for an individual compound is approximately 5 μ g/kg (ppb) (wet weight) for soil/sediment samples, 0.5 mg/kg (ppm) (wet weight) for wastes, and 5 μ g/L (ppb) for ground water. PQLs will be proportionately higher for sample extracts and samples that require dilution or reduced sample size to avoid saturation of detector.
- 1.4 Method 8240 is based upon a purge-and -trap, gas chormatographic/mass spectrometric (GC/MS) procedure. This method is restricted to use by, or under the supervision of, analysts experienced in the use of purge-and-trap systems and gas chromatograph/mass spectrometers, and skilled in the interpretation of mass spectra and their use as a quantitative tool.

2. SAFETY AND WASTE HANDLING

- 2.1 Eye Contact Safety glasses with eye shields must be worn when working in the laboratory.
- 2.2 Hand Contact Use of disposable vinyl or latex gloves provide adequate protection from contact with the samples. All skin contact must be washed off immediately.

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SUPERSEDES:

NEW

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Respiratory - Exposure to the vapors from the sample should be kep 2.3 to a minimum by working in a well-ventilated area.

- Analyst must be aware of MSDS for all chemicals used in the lab. 2.4
- Waste Disposal The sample is stored, refrigerated, for six weeks. 2.5 After six weeks the sample is placed in the waste solvent container for later disposal. Standards are placed in the waste solvent container for disposal.

Contaminated wipes are placed in a metal container that has been lined with a plastic trash bag. A metal top must be kept on the container at all times except to add to or remove the contents.

SUMMARY OF METHOD <u>3.</u>

The volatile compounds are introduced into the gas chromatograph by 3.1 the purge-and-trap method or by direct injection. The components are separated via the gas chromatograph and detected using a mass spectrometer, which is used to provide both qualitative and quantitative information. The chromatographic conditions, as well as typical masss spectrometer operation parameters, are given.

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TABLE 1. RETENTION TIMES AND CHARACTERISTIC IONS FOR VOLATILE COMPOUNDS

	Datambian	Designature	
Compound	Retention Time (min)	Primary Ion	Secondary Ion(s)
Acetone	5.3	43	58
Benzene	9.6	78	52, 77
Bromochloromethane (I.S.)	8.6	128	49, 130, 51
Bromodichloromethane	11.4	83	85, 129
4-Bromofluorobenzene (surr)	16.8	95	174, 176
Bromoform	16.3	173	171, 175, 252
Bromomethane	3.7	94	96, 79
2-Butanone	8.3	72	57, 43
Carbon disulfide	11.0	76	78
Carbon tetrachloride	9.3	117	119, 121
Chlorobenzene	14.8	112	114, 77
Chlorobenzene-d ₅ (I.S.)	14.8	117	82, 119
Chlorodibromomethane	13.9	129	208, 206
Chlorethane	3.8	64	66, 49
2-Chloroethyl vinyl ether	11.9	63	65, 106
Chloroform	8.8	83	85, 47
Chloromethane	3.0	50	52, 49
Dichlorodifluoromethane**	5.2	85	87, 50, 101
1,1-Dichloroethane	7.3	63	65, 83
1,2-Dichloroethane	9.6	62	64, 98
1,2-Dichloroethane-d4 (surr.)	9.5	65	102
1,1-Dichloroethene	9.0	96	61, 98
trans-1,2-Dichloroethene	6.6	96	61, 98
1,2-Dichloropropane	11.0	63	62, 41
cis-1,3-Dichloropropene	12.1	. 75	77, 39
trans-1,3-Dichloropropene	12.9	75	77, 39
1.4-Difluorobenzene (I.S.)	10.2	114	63, 88
Ethylbenzene	15.0	106	91
2-Hexanone	13.6	43	58, 57, 100
Methylene chloride	6.1	84	49, 51, 86
4-Methyl-2-pentanone	12.3	43	58, 100
Styrene	16.0	104	78, 103
1,1,2,2-Tetrachloroethane	17.0	83	85, 131, 133
Tetrachlorethene	13.5	164	129, 131, 166
Toluene	12.6	92	91, 65
Toluene-d ₈ (surr.)	12.5	98	70, 100
1,1,1-Trichloroethane	9.1	97	99, 117
1,1,2-Trichloroethane	13.2	97	83, 85, 99
Trichloroethene	10.6	130	95, 97, 132
Trichlorofluoromethane**	4.2	101	103, 66
1,2,3-Trichloropropane		75	110, 77, 61
Vinyl acetate	7.4	43	86
Vinyl chloride	3.1	62	64, 61
Xylene	15.3	106	91

^{**} Only if carbon trap used

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SUPERSEDES:

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3.2 If the above sample introduction techniques are not applicable, a portion of the sample is dispersed in methanol to dissolve the volatile organic constituents. A portion of the methanolic solution is combined with water. It is then analyzed by purge-and-trap GC/MS following the normal water method.

3.3 The purge-and-trap process: An inert gas is bubbled through the solution at ambient temperature, and the volatile components are transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the volatile components are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb the components onto a gas chromatographic column. The gas chromatographic column is heated to elute the components, which are detected with a mass spectrometer.

4. SAMPLE HANDLING AND PRESERVATION

4.1 Samples are prepared by EPA Method 1311. Samples are stored at 4°C until assayed.

5. INTERFERENCES

- 5.1 Interferences purged or coextracted from the samples will vary considerably from source to source. The analytical system, however, is checked to ensure freedom from interferences, under the analysis conditions, by analyzing method blanks.
- 5.2 Cross-contamination can occur whenever high-level and low-level samples are analyzed sequentially. Whenever an unusually concentrated sample is analyzed the sample immediately following should be re-analyzed if a positive result for an analyte in the prior sample is obtained. The purge-and-trap system may require extensive bake-out and cleaning after a high-level sample.
- 5.3 All solvents are to be kept in the hood.
- 5.4 The analytical system must be demonstrated to be free from contamination under the conditions of the analysis by running laboratory reagent blanks.

6. APPARATUS

- 6.1 Syringe: 5-ml, gas tight.
- 6.2 <u>Balance</u>: Analytical, capable of accurately weighing 0.0001 g, and top-loading balance capable of weighing 0.1 g.

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6.3 <u>Glass scintillation vials</u>: 20-mL, with screw caps and Teflon liners or glass culture tubes with a screw cap and Teflon liner.

- 6.4 <u>Volumetric flasks</u>: 10-mL and 100-mL, class A with ground-glass stoppers.
- 6.5 <u>Vials</u>: 2-mL, for GC autosampler.
- 6.6 Spatula: Stainless steel.
- 6.7 <u>Disposable pipets</u>: Pasteur.
- 6.8 <u>Purge-and-trap device</u>: Tekmar LSC 2000 or equivalent consisting of three separate pieces of equipment: the sample purger, the trap, and the desorber.
 - 6.8.1 The purging chamber is designed to accept 5-mL samples with a water column at least 3 cm deep. The gaseous headspace between the water column and trap must have a total volume of less than 15 mL. The purge gas must pass through the water column as finely divided bubbles with a diameter of less than 3-mm at the origin.
 - 6.8.2 The trap must be at least 25 cm long and have an inside diameter of at least 0.105 in. Before initial use, the trap should be conditioned overnight at 180°C by backflushing with an inert gas flow of at least 20 mL/min. Tekmar part number 14-0124-003 or equivalent.
 - 6.8.3 The desorber should be capable of rapidly heating the trap to 180°C for desorption. The polymer section of the trap should not be heated higher than 180°C, and the remaining sections should not exceed 220°C during bake-out mode.

6.9 Gas chromatograph/mass spectrometer system:

- 6.9.1 Gas chromatograph: HP-5980 Series II
- 6.9.2 Column: DB-624 75m x 0.53mm ID 3μ m Film thickness. J & W Cat. Number 125-1334.
- 6.9.3 Mass spectrometer: HP-MSD 5970 Capable of producing a mass spectrum that meets all the criteria in Table 2 when 50 ng of 4-bromofluorobenzene (BFB) are injected through the gas chromatograph inlet.
- 6.9.4 Data system: A UNIX based 9000, series 400 computer operating Target software is interfaced to the mass spectrometers. The most recent version of the EPA/NIH Mass Spectral Library is available.

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TABLE 2. BFB KEY ION ABUNDANCE CRITERIA

Mass	Ion Abundance Criteria
50	15 to 40% of mass 95
75	30 to 60% of mass 95
95	base peak, 100% relative abundance
96	5 to 9% of mass 95
173	less than 2% of mass 174
174	greater than 50% of mass 95
175	5 to 9% of mass 174
176	greater than 95% but less than 100% of mass 174
177	5 to 9% of mass 176

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7. REAGENTS/STANDARDS

7.1 Stock solutions (TCLP mix) are prepared from pure compounds. The pure compounds are diluted in 10 mL of Methanol to yield a solution containing 10,000 ppm of each compound except Methyl Ethyl Ketone which has a concentration of 20,000 ppm. The amount of each standard to add to 10 mL Methanol is given below.

Compound (CAS number)	Amount to Add	<u>Concentration</u>
Benzene (71-43-2)	114 µL	10,000 ppm
Carbon Tetrachloride (56-23-5)	63 µL	10,000 ppm
Chlorobenzene (108-90-7)	90 μL	10,000 ppm
Chloroform (67-66-3)	67 µL	10,000 ppm
1,4-Dichlorobenzene (95-50-1)	0.0988 g	10,000 ppm
1,2-Dichloroethane (107-06-2)	79.6 µL	10,000 ppm
Methyl Ethyl Ketone (78-93-3)	$250~\mu$ L	20,000 ppm
Tetrachloroethylene (127-18-4)	62 µL	10,000 ppm
Trichloroethylene (79-01-6)	68.5μ L	10,000 ppm

Mix the stock solution by inverting three times.

7.1.1 Dichloroethylene	89 µL	10,000 ppm
Vinyl Chloride		

- 7.1.2 Stock standards are stored at -20°C for a maximum of six months.
- 7.2 <u>Secondary dilution standards</u>: Using stock standard solutions, prepare in methanol secondary dilution standards containing the compounds of interest mixed together. Secondary dilution standards must be stored with minimal headspace and should be checked frequently for signs of degradation or evaporation, especially just prior to preparing calibration standards from them. This standard has a one month expiration date.
- 7.3 Surrogate standards: The surrogates are toluene-d8, 4-bromfluorobenzene, and 1,2-dichlorethane-d4. Other compounds may be used as surrogates, depending upon the analysis requirements. Each sample undergoing GC/MS analysis must be spiked with 10 μ L of the surrogate spiking solution prior to analysis. The stock surrogates are purchased from Restek part number 30004 or equivalent. These standards have a one month expiration date and have a 25 ppm conc.
- Internal standards: The internal standards are bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d5. Other compounds may be used as internal standards as long as they have retention times similar to the compounds being detected by GC/MS. It is recommended that the secondary dilution standard should be prepared at a concentration of 25 μ g/mL of each internal standard compound. Stock Internal Standard mixes are purchased from Restek part number 30011 or equivalent.

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SUPERSEDES:

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7.5 4-Bromofluorobenzene (BFB) standard: A standard solution containi 50 ng/µL of BFB in methanol should be prepared.

- Calibration standards: Calibration standards at 20, 50, 100, 150, 7.6 and 200 ppb concentration levels should be prepared from the secondary dilution of stock standards (see Sections 7.1 and 7.2). Prepare these solutions in reagent water. Each standard should contain each analyte for detection by this method. These standards have a one month expiration date.
- Matrix spiking standards: The standard used for the daily 7.7 calibration check is used for spiking the sample.
- Reagent water: Reagent water is defined as water in which an 7.8 interferent is not observed at the method detection limit (MDL) of the parameters of interest. Reagent water is prepared with a Millipore Super-Q system.
- Methanol: Pesticide quality or equivalent. Store apart from other 7.9 solvents.
- 7.10 SPCC and CCC Mid-level calibration standards.

PREVENTIVE MAINTENANCE 8.

All maintenance must be recorded in maintenance logbook. 8.1

TROUBLESHOOTING/CORRECTIVE ACTION 9.

When peak tailing occurs the liner should be changed and the first 6 9.1 inches of the analytical column removed.

10. QUALITY CONTROL

- 10.1 Before processing any samples, the analyst must demonstrate, through the analysis of a reagent water blank, that interferences from the analytical system, glassware, and reagents are under control. Each time a set of samples is extracted or there is a change in reagents, a reagent water blank must be processed as a safeguard against chronic laboratory contamination. The blank samples must be carried through all stages of the sample preparation and measurement steps.
- Each day that analysis is performed, the daily calibration standard 10.2 must be evaluated to determine if the chromatographic system is operating properly. If any changes are made to the system (e.g, column changed), recalibration of the system must take place. Refe to Table 3 for criteria.

10.3 Required instrument QC is found in the following section:

- 10.3.1 The GC/MS system must be tuned to meet the BFB specifications in Table 2.
- 10.3.2 There must be an initial calibration of the GC/MS system as specified in 11.1.5. The RSD must be < 25%.
- 10.3.3 The GC/MS system must meet the SPCC criteria specified in 11.1.8 and the CCC criteria in 11.1.9, each 12 hr.
- 10.4 When one of the analytes fail any of the acceptance criteria listed in Table 3, the analyst must proceed according to below:
 - 10.4.1 Repeat the test only for those analytes that failed to meet criteria. Repeated failure will confirm a general problem with the measurement system.
 - Locate and correct the source of the problem and repeat the test for all analytes.
 - 10.4.3 % RSD must be less than 30%.
- 10.5 The laboratory must analyze a reagent blank, a matrix spike, and a matrix spike duplicate for each analytical batch (up to a maximum of 20 samples/batch) to assess accuracy.
 - The samples are spiked with 2.5 μ L of the 100 ppm TCLP mix, 2.5 μ L of the 100 ppm solution of 1,1-Dichloroethane and 1.0 μ L of the 200 ppm Vinyl Chloride solution. The TCLP mix is made from a stock solution containing 10,000 ppm of each of the following compounds: Benzene, Carbon Tetrachloride, Chlorobenzene, Chloroform, 1,4-Dichlorobenzene, 1,2-Dichlorobenzene, Tetrachloroethylene and Trichloroethylene. All recoveries must be between 70 120%.

TABLE 3. CALIBRATION AND QC ACCEPTANCE CRITERIA®

Parameter	Range for Q (µg/L)	Limit for s (µg/L)	Rang <u>e</u> for x (µg/L)	Range p, p _s (%)
Benzene	12.8-27.2	6.9	15.2-26.0	37-151
Bromodichloromethane	13.1-26.9	6.4	10.1-28.0	35-155
Bromoform	14.2-25.8	5.4	11.4-31.1	45-169
Bromomethane	2.8-37.2	17.9	D-41.2	D-242
Carbon tetrachloride	14.6-25.4	5.2	17.2-23.5	70-140
Chorbenzene	13.2-26.8	6.3	16.4-27.4	37-160
2-Chloroethylvinyl ether	D-44.8	25.9	D-50.4	D-305
Chloroform	13.5-26.5	6.1	13.7-24.2	51-138
Chloromethane	D-40.8	19.8	D-45.9	D-273
Dibromochloromethane	13.5-26.5	6.1	13.8-26.6	53-149
1,2-Dichlorbenzene	12.6-27.4	7.1	11.8-34.7	18-190
1,3-Dichlorobenzene	14.6-25.4	5.5	17.0-28.8	59-156
1,4-Dichlorobenzene	12.6-27.4	7.1	11.8-34.7	18-190
1,1-Dichloroethane	14.5-25.5	5.1	14.2-28.4	59-155
1,2-Dichloroethane	13.6-26.4	6.0	14.3-27.4	49-155
1,1-Dichloroethene	10.1-29.9	9.1	3.7-42.3	D-234
trans-1,2-Dichloroethene	13.9-26.1	5.7	13.6-28.4	54-156
1,2-Dichloropropane	6.8-33.2	13.8	3.8-36.2	D-2
cis-1,3-Dichloropropene	4.8-35.2	15.8	1.0-39.0	D-227
trans-1,3-Dichloropropene	10.0-30.0	10.4	7.6-32.4	17-183
Ethyl benzene	11.8-28.2	7.5	17.4-26.7	37-162
Methylene chloride	12.1-27.9	7.4	D-41.0	D-221
1,1,2,2-Tetrachloroethane	12.1-27.9	7.4	13.5-27.2	46-157
Tetrachloroethene	14.7-25.3	5.0	17.0-26.6	64-148
Toluene	14.9-25.1	4.8	16.6-26.7	47-150
1,1,1-Trichloroethane	15.0-25.0	4.6	13.7-30.1	52-162
1,1,2-Trichloroethane	14.2-25.8	5.5	14.3-27.1	52-150
Trichloroethene	13.3-26.7	6.6	18.5-27.6	71-157
Trichlorofluoromethane	9.6-30.4	10.0	8.9-31.5	17-181
Vinyl chloride	0.8-39.2	20.0	D-43.5	D-251

Q = Concentration measured in QC check sample, in μ g/L.

s = Standard deviation of four recovery measurements, in μ g/L.

 $x = Average recovery for four recovery measurements, in <math>\mu g/L$.

p,ps = Percent recovery measured.

D = Detected; result must be greater than zero.

Criteria from 40 CFR Part 136 for Method 624 and were calculated assuming a QC check sample concentration of 20 μg/L. These criteria are based directly upon the method performance data.

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10.5.2 Spike one sample per batch or matrix type with as follows:

2.5 μ L TCLP mix

2.5 μ L 1,1-Dichloroethene

1.0 µL Vinvl Chloride

- 10.5.3 Compare the percent recovery (p) for each analyte with the corresponding QC acceptance criteria found in Table 3.
- 10.5.4 If any individual p falls outside the designated range for recovery, that analyte has failed the acceptance criteria. A check standard containing each analyte that failed the criteria must by analyzed.
- Compare the percent recovery (p_S) for each analyte with the corresponding QC acceptance criteria found in Table 3. Only analytes that failed the test in Section 10.5 need to be compared with these criteria. If the recovery of any such anlayte falls outside the designated range, the laboratory performance for that analyte is judged to be out of control, and the problem must be immediately identified and corrected. The result for that anlayte in the unspiked sample is suspect and may not be reported for regulatory compliance purposes.
- 10.6 The surrogates are diluted from 2,500 ppm standard to a final concentration of 25 ppm. Fifty (50) microliters of the concentrated surrogate is diluted to 5 mL in methanol. Surrogate limits are given below:

Limit (% Recovery)

4-Bromofluorobenzene	86-115
1,2-Dichlorobenzene-d4	76-114
Toluene-d8	88-110

The %RPD for each individual CCC should be <u>less</u> than 30 percent. This criterion must be met in order for the individual calibration to be valid. The CCCs are:

1,1-Dichloroethene Chloroform,
1,2-Dichloropropane,
Toluene,
Ethylbenzene, and
Vinyl chloride.

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10.7 System Performance Check Compounds (SPCCs): A system performance check must be made every 12 hrs. of analysis time. If the SPCC criteria are met a comparison of response factors is made for all compounds. This is the same check that is applied during the initial calibration. If the minimum response factors are not met, the system must be evaluated, and corrective action must be taken before sample analysis begins. The minimum response factor for volatile SPCCs is 0.300 (0.250 for Bromoform). Some possible problems are standard mixture degradation, injection port inlet contamination, contamination at the front end of the analytical column, and active sites in the column or chromatographic system. All compounds except Methyl Ethyl Ketone are SPCCs.

10.8 Calibration Check Compounds (CCCs): After the system performance check is met, CCCs are used to check the validity of the initial calibration. Calculate the percent difference using:

 $% Difference = (RF(I) - RF(C)) / RF(I) \times 100$

where:

RFI = average response factor from initial calibration.

RFc = response factor from current verification check standard.

If the percent difference for each CCC is less than 25%, the initial calibration is assumed to be valid. If the criterion is not met (>25% difference), for any one CCC, corrective action MUST be taken. Problems similar to those listed under SPCC's could affect this criterion. If no source of the problem can be determined after corrective action has been taken, a new five-point calibration MUST be generated. This criterion MUST be met before quantitative sample analysis begins.

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11. PROCEDURE

Initial calibration for purge-and-trap procedure:

11.1.1 GD/MS operating conditions:

Electron energy:

Mass Range

Scan time:

Initial column temperature: Initial column holding time:

Column temperature program: Final column temperature: Final column holding time: Injector temperature:

Source temperature:

Transfer line temperature Carrier gas:

70 volts (nominal).

35-260 amu.

To give 5 scans/peak but not to exceed 7 sec/scan.

0 min. 10°C/min 135°C. 1 min. 200°C.

35°C.

According to manufacturer's

specifications

250-300°C.

Helium at 30 cm/sec.

- Each GC/MS system must be hardware-tuned to meet the 11.1.2 criteria in Table 2 for a 50-ng injection or purging of 4-bromfluorobenzene (2- μ L injection of the BFB standard). Analyses must not begin until these criteria are met.
- 11.1.3 Assemble a purge-and-trap device that meets the specification in Section 6.11. Condition the trap overnight at 180°C in the purge mode with an inert gas flow of at least 20 mL/min. Prior to use, condition the trap daily for 10 min while backflushing at 180° with the column at 220°C.
- 11.1.4 Connect the purge-and-trap device to a gas chromatograph.
- 11.1.5 A five-point calibration curve is developed using appropriate calibration standards. Introduce the sample into the purge and trap device using the 3-way valve.
 - 11.1.5.1 Add 250 μ L of Anti-foam to each sample. samples are checked for foaming. If the sample foams add an additional 250 μL of Anti-foam and retest.
- Carry out the purge-and-trap analysis procedure as 11.1.6 described in Section 11.3.1.

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Tabulate the area response of the characteristic ion (see Table 1) against concentration for each compound and each internal standard. Calculate response factor (RF) for each compound relative to one of the internal standards. The internal standard selected for the calculation of the RF for a compound should be the internal standard that has a retention time closest to the compound being measured. The RF is calculated as follows:

 $RF = (A_xC_{is}) / (A_{is}C_x)$

where:

- A_x = Area of the characteristic ion for the compound being measured.
- A_{is} = Area of the characteristic ion for the specific internal standard.
- Cis = Concentration of the specific internal standard.
- C_x = Concentration of the compound being measured.
- The average RF must be calculated for each compound. A system performance check should be made before this calibration curve is used. Five compounds (the System Performance Check Compounds, or SPCCs) are checked for a minimum average response factor. these compounds are chloromethane, 1,1-dichloroethane, bromoform, 1,1,2,2-tetrachloroethane, and chlorobenzene. The minimum acceptable average RF for these compounds should be 0.300 (0.250 for bromoform). These compounds typically have RFs of 0.4-0.6 and are used to check compound instability and check for degradation caused by contaminated lines or active sites in the system. Examples of these occurrences:
 - 11.1.8.1 <u>Chloromethane</u>: This compound is the most likely compound to be lost if the purge flow is too fast.
 - Bromoform: This compound is one of the compounds most likely to be purged very poorly if the purge flow is too slow. Cold spots and/or active sties in the transfer lines may adversely affect response.

 Response of the quantitation ion (m/z 173) is directly affected by the tuning of BFB at ion m/z 174/176. Increasing the m/z 174/176 ratio may improve bromoform response.

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11.1.8.3 <u>Tetrachloroethane and 1,1-dichlorethane:</u>
These compounds are degraded by contaminated transfer lines in purge-and-trap systems and/or active sites in trapping materials.

Using the RFs from the initial calibration, calculate the percent relative standard deviation (%RSD) for Calibration Check Compounds (CCCs).

RSD = x 100

where:

RSD = relative standard deviation.

x = mean of 5 initial RFs for a compound.

SD = standard deviation of average RFs for a compound.

RSD must be less than 30%

$$SD = \begin{bmatrix} N & \\ \delta & (x_1 - x) \\ i=1 & N-1 \end{bmatrix}$$

11.2 Daily GC/MS calibration:

- 11.2.1 Prior to the analysis of samples, inject or purge 50-ng of the 4-bromofluorobenzene standard. The resultant mass spectra for the BFB must meet all of the criteria given in Table 2 before sample analysis begins. These criteria must be demonstrated each 12-hr shift.
- The initial calibration curve for each compound of interest must be checked and verified once every 12 hrs. of analysis time. This is accomplished by analyzing a calibration standard that is at a concentration near the midpoint concentration for the working range of the GC/MS by checking the SPCC and CCC.

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The internal standard responses and retention times in the check calibration standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 sec from the last check calibration (12 hr), the chromatographic system must be inspected for malfunctions and corrections must be made, as required. If the EICP area for any of the internal standards changes by a factor of two (-50% to +100%) for the last daily calibration standard check, the mass spectrometer must be inspected for the malfunctions and corrections must be made, as appropriate. When corrections are made, reanalysis of samples analyzed while the system was malfunctioning are necessary.

11.3 GC/MS analysis:

11.3.1 Water samples:

- 11.3.1.1 All samples and standard solutions must be allowed to warm to ambient temperature before analysis.
- 11.3.1.2 Set up the GC/MS system as outlined in Paragraph 11.1.1
- 11.3.1.3 BFB tuning criteria and daily GC/MS calibration criteria must be met before analyzing samples.
- 11.3.1.4 Adjust the purge gas (helium) flow rate to 25-40 mL/min on the purge-and-trap device. Optimize the flow rate to provide the best response for chloromethane and bromoform, if these compounds are analytes. Excessive flow rate reduces chloromethane response, whereas insufficient flow reduces bromoform response.
- 11.3.1.5 To a syringe containing 5 mL of DI water, add 250 μ L of the sample and 10 μ L of the Internal Standard/Surrogate mixture.
- 11.3.1.6 The following procedure is appropriate for diluting purgeable samples. All steps must be performed without delays until the diluted sample is in a gas-tight syringe.
 - 11.3.1.6.1 Dilutions may be made in volumetric flasks (10-to 100-mL). Select the volumetric flask the will allow for the necessary dilution. Intermediate dilutions may be necessary for extremely large dilutions.

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- 11.3.1.6.2 Calculate the approximate volume of reagent water to be added to the volumetric flask selected and add slightly less than this quantity of reagent water to the flask.
- 11.3.1.6.3 Inject the proper aliquot of samples from the syringe into the flask. Aliquots of less than 1-mL are not recommended. Dilute the sample to the mark with reagent water. Cap the flask, invert, and shake three times. Repeat above procedure for additional dilutions.
- 11.3.1.6.4 Fill a 5-mL syringe with the diluted sample.
- 11.3.1.7 Add 10.0 μ L of surrogate spiking solution and 10 μ L of internal standard spiking solution through the valve bore of the syringe; then close the valve. The surrogate and internal standards may be mixed and added as a single spiking solution. The addition of 10 μ L of the surrogate spiking solution to 5 mL of sample is equivalent to a concentration of 50 μ g/L of each surrogate standard.
- 11.3.1.8 Attach the syringe-syringe valve assembly to the syringe valve on the purging device.

 Open the syringe valves and inject the sample into the purging chamber.
- 11.3.1.9 Close both valves and purge the sample for 11.0 ± 0.1 min at ambient temperature.
- 11.3.1.10 While the trap is being desorbed into the gas chromatograph, empty the purging chamber. Wash the chamber with a minimum of two 5-mL flushes of reagent water (or methanol followed by reagent water) to avoid carryover of pollutant compounds into subsequent analyses.

11.3.1.11 After desorbing the sample for 4 min, recondition the trap by returning the purge-and-trap device to the purge mode. Wait 15 sec; then close the syringe valve on the purging device to begin gas flow through the trap. The trap temperature should be maintained at 180°C. Trap temperatures up to 220° may be employed; however, the higher temperature will shorten the useful life of the trap. After approximately 7 min, turn off the trap heater and open the syringe valve to stop the gas flow through the trap. When cool, the trap is ready for the next sample.

- 11.3.1.12 If the initial analysis of a sample or a dilution of the sample has a concentration of analytes that exceeds the initial calibration range, the sample must be reanalyzed at a higher dilution. Secondary ion quantitation is allowed only when there are sample interferences with the primary ion.
- 11.3.1.13 For matrix spike analysis, add the following matrix spike solutions to the 5 mL of sample purged.
 - 2.5 μ L TCLP mix (100 ppm)
 - 2.5 μL 1,1-Dichloroethene (100 ppm)
 - 1.0 μL Vinyl Chloride (200ppm)

Disregarding any dilutions, this is equivalent to a concentration of 50 μ g/L of each matrix spike standard.

11.3.1.14 All dilutions should keep the response of the major constituents (previously saturated peaks) in the upper half of the linear range of the curve. Proceed to Sections 11.4.1 and 11.4.2 for qualitative and quantitative analysis.

11.3.2 Water-miscible liquids:

11.3.2.1 Water-miscible liquids are analyzed as water samples after first diluting them at least 20-fold with reagent water.

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11.3.2.2 Prepare dilutions directly in a 5-mL syringe filled with reagent water by adding at least 1.0 μ L, but not more than 500- μ L of liquid sample. The Internal Standard/Surrogate mixed standard is added to 5 mL of reagent water before the sample.

11.3.3 Sediment/soil and waste samples: Samples are extracted with an equal weight of methanol. The methanol extract is then treated as a water sample.

11.4 Data interpretation:

11.4.1 Qualitative analysis:

11.4.1.1 An analyte (e.g., those listed in Table 1) is indentified by comparison of the sample mass spectrum with the masss spectrum of a standard of the suspected compound (standard reference spectrum). Mass spectra for standard reference should be obtained within the same 12 hours as the sample analysis. These standard reference spectra may be obtained through analysis of the calibration Two criteria must be satisfied to standards. verify indentification: (1) elution of sample component at the same GC relative retention time (RRT) as those of the standard component; and (2) correspondence of the sample component and the standard component mass spectrum.

11.4.1.1.1 The sample component RRT must compare within ± 0.06 RRT units of the RRT of the standard component. For reference, the standard must be run within the same 12 hr as the sample. If coelution of interfering components prohibits accurate assignment of the sample component RRT from the total ion chromatogram, the RRT should be assigned by using extracted ion current profiles for ion unique to the component of interest.

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11.4.1.1.2 (1) All ions present in the standard mass spectra at a relative intensity greater than 10% (most abundant ion in the spectrum equals 100% must be present in the sample spectrum).

(2) The relative intensities of ions specified in (1) must agree within plus or minus 20% between the standard and sample spectra.

(Example: For an ion with an

abundance of 50% in the standard spectra, the corresponding sample abundance must be between 30 and

11.4.1.2 For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the type of analyses being conducted. Guidelines for making tentative identification are:

70 percent.

- (1) Relative intensities of major ions in the reference spectrum (ions >10% of the most abundant ion) should be present in the sample spectrum.
- (2) The relative intensities of the major ions should agree within ±20% (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must between 30 and 70%).
- (3) Molecular ions present in the reference spectrum should be present in the sample spectrum.
- (4) Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds.
- (5) Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or coeluting peaks. Data system library reduction programs can sometimes create these discrepancies.

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Computer generated library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other. Only after visual comparison of sample with the nearest library searches will the mass spectral interpretation specialist assign a tentative identification.

Quantitative analysis: 11.4.2

- 11.4.2.1 When a compound has been identified, the quantification of that compound will be based on the integrated abundance from the EICP of the primary characteristic ion. Quantification will take place using the internal standard technique. The internal standard used shall be the one nearest the retention time of that of a given analyte (e.g., see Table 4).
- Calculate the concentration of each 11.4.2.2 identified analyte in the sample as follows:

concentration
$$(\mu g/L) = \frac{(A_x)(I_s)}{(A_{is})(RF)(V_o)}$$

where:

 A_x = Area of characteristic ion for compound being measured.

 $I_s = Amount of internal standard injected$ (ng).

Ais = Area of characteristic ion for the internal standard.

RF = Response factor for compound being measured (Paragraph 7.2.7).

 $V_o = Volume of water purged (mL), taking into$ consideration any dilutions made.

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TABLE 4. VOLATILE INTERNAL STANDARDS WITH CORRESPONDING ANALYTES ASSIGNED FOR QUANTITATION

Bromochloromethane

Acetone Acrolein Acrylonitrile Bomomethane Carbon disulfide Chloroethane Chloromethane Dichlorodifluoromethane 1,1-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane (surrogate) 1,1-Dichloroethene trans-1,2-Dichloroethene Iodomethane Methylene chloride Trichlorofluoromethane Vinyl chloride

1,4-Difluorobenzene

Benzene Bromodichloromethane Bromoform 2-Butanone Carbon tetrachloride Chlorodibromomethane 2-Choroethyl vinyl ether Dibromomethane 1,4-Dichloro-2-butene 1,2-Dichloropropane cis-1,3-Dichloropropene trans-1,3-Dichloropropene 1,1,1-Trichlorethane 1,1,2-Trichloroethane Trichloroethene Vinyl acetate

Chlorbenzene-ds

Bromofluorbenzene (surrogate)
Chlorobenzene
Ethylbenzene
Ethyl mehtacrylate
2-Hexanone
4-Methyl-2-pentanone
Styrene
1,1,2,2-Tetrachlorethane
Tetrachloroethene
Toluene
Toluene-d8 (surrogate)
1,2,3-Trichloropropane
Xylene

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Sediment/soil samples are generally reported 11.4.2.3 on a dry weight basis, while sludges and wastes are reported on a wet weight basis. The % moisture of the sample (as calculated in Paragraph 7.4.1.3.5) should be reported along with the data in either instance.

- 11.4.2.4 Where applicable, an estimate of concentration for noncalibrated components in the sample should be made. The formulas given above should be used with the following modifications: The areas A_x and A_{is} should be from the total ion chromatograms, and the RF for the compound should be assumed to be 1. The concentration obtained should be reported indication (1) that the value is an estimate and (2) which internal standard was used to determine concentration. Use the nearest internal standard free of interferences.
- Report results without correction for 11.4.2.5 recovery data. When duplicates and spiked samples are analyzed, report all data obtained with the sample results.

12. CALCULATION

Concentration
$$(\mu g/L) = \frac{(A_x)(I_s)}{(A_{is})(RF) V_o}$$

where:

 A_x = Area of ion for compound being measured

Is = Amount of Internal Standard Injected

 A_{is} = Area of ion for Internal Standard

RF = Response Factor

V_o = Volume of sample purged

13. REFERENCES

U.S. EPA 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act, Method 624," October 26, 1984.

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APPENDIX VII-C-4

ORGANIC ANALYSES PROTOCOL
GAS CHROMATOGRAPHY/ MASS SPECTROMETRY (GC/MS)
ANALYSIS OF SEMI-VOLATILES

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STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF TCLP TITLE:

> SEMIVOLATILE ORGANIC COMPOUNDS (BASED ON: EPA METHOD 8270)

(KEY WORDS: SEMIVOLATILE ORGANICS, GC/MS, TCLP)

1. SCOPE AND APPLICATION

-- **

- 1.1 Method 8270 is used to determine the concentration of semivolatile organic compounds in extracts prepared from all types of solid waste matrices, soils, and ground water. Direct injection of a sample may be used in limited applications.
- 1.2 Method 8270 can be used to quantify most neutral, acidic, and basic organic compounds that are soluble in methylene chloride and capable of being eluted without derivatization as sharp peaks from a gas chromatographic fused-silica capillary column coated with a slightly polar silicone. Such compounds include polynuclear aromatic hydrocarbons, chlorinated hydrocarbons and pesticides, phthalate esters, organophosphate esters, nitrosamines, haloethers, aldehydes, ethers, ketones, anilines, pyridines, quinolines, aromatic nitro compounds, and phenols, including nitrophenols.
- 1.3 The following compounds may require special treatment when being determined by this method. Pentachlorophenol, 2,4-dinitrophenol, 4nitrophenol, 4,6-dinitro-2-methylphenol, 4-chloro-3-methylphenol, benzoic acid, 2-nitroaniline, 3-nitroaniline, 4-chloroaniline, and benzyl alcohol are subject to erratic chromatographic behavior, especially if the GC system is contaminated with high boiling material.
- 1.4 This method is restricted to use by or under the supervision of analysts experienced in the use of gas chromatograph/mass spectrometers and skilled in the interpretation of mass spectra. analyst must demonstrate the ability to generate acceptable results with this method.

2. SAFETY AND WASTE HANDLING

- 2.1 Eye Contact Safety glasses with eye shields must be worn when working in the laboratory.
- Hand Contact Use of disposable vinyl or latex gloves provide 2.2 adequate protection from contact with the samples. All skin contact must be washed off immediately.
- 2.3 Respiratory Exposure to the vapors from the sample should be kept to a minimum by working in a well-ventilated area.

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2.4 Analyst must be aware of MSDS for all chemicals used in the lab.

2.5 Waste Disposal - The sample is stored, refrigerated, for six weeks. After six weeks the sample is placed in the waste solvent container for later disposal. Standards are placed in the waste solvent container for disposal.

Contaminated wipes are placed in a metal container that has been lined with a plastic trash bag. A metal top must be kept on the container at all times except to add to or remove the contents.

SUMMARY OF METHOD 3.

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3.1 Prior to using this method, the samples should be prepared for chromatography using the appropriate sample preparation and cleanup methods. This method describes chromatographic conditions that will allow for the separation and quantitation of the compounds in the extract.

SAMPLE HANDLING AND PRESERVATION

Samples are received from the BNA prep lab in autosampler vials. vials are stored at 0°C until assayed.

INTERFERENCES

- 5.1 Raw GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. Determine if the source of interference is in the preparation and/or cleanup of the samples and take corrective action to eliminate the problem.
- 5.2 Contamination by carryover can occur whenever high-level and low-level samples are sequentially analyzed. To reduce carryover, the sample syringe must be rinsed out between samples with solvent.

6. APPARATUS

- 6.1 Gas chromatograph/mass spectometer system:
 - Gas chromatograph: HP-5890 Series II or equivalent 6.1.1
 - Column: 30-m x 0.25-mm I.D. (or 0.32-mm I.D.) 1-um film 6.1.2 thickness (J&W Scientific DB-5 or equivalent). J & W catalog number 122-5633.

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6.1.3 Mass spectrometer: HP-5970 MSD or equivalent. The mass spectrometer must be capable of producing a mass spectrum for decafluorotriphenylphosphine (DFTPP) which meets all of the criteria in Table 1 when 50 ng of DFTPP is injected through the gas chromatograph.

TABLE 1 DFTPP KEY IONS AND ION ABUNDANCE CRITERIA

Mass	Ion Abundance Criteria
51	30-60% of mass 198
68	<2% of mass 69
70	<2% of mass 69
127	40-60% of mass 198
197	<1% of mass 198
198	Base peak, 100% relative abundance
199	5-9% of mass 198
275	10-30% of mass 198
365	>1% of mass 198
441	Present but less than mass 443
442	>40% of mass 198
443	17-23% of mass 442

- 6.1.4 GC/MS interface: A direct interface from the GC to the MS is used.
- 6.1.5 Data system: HP-UX. The system allows the continuous acquisition and storage on machine-readable tape of all mass spectra obtained throughout the duration of the chromatographic program. The computer has software that can search any GC/MS data file for ions of a specific mass and that can plot such ion abundances versus time or scan number. The most recent version of the EPA/NIH Mass Spectral Library is available.
- 6.2 Syringe: $10-\mu L$.
- 6.3 Analytical Balance: capable of weighing 0.001 g.

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7. REAGENTS/STANDARDS

7.1 Stock Standard Solutions: The following stock standards at the concentration given are purchased from Absolute Standards. Consult the Absolute Standard catalog for specific compounds in each standard.

Cat. No.	Standard	Concentration
10001	Base Neutrals #1	2000 μg/mL
10002	Base Neutrals #2	2000 μg/mL
10004	Toxic Substances #1	2000 μg/mL
10005	Toxic Substances #2	2000 μ g/mL
10006	Benzidine & 3,3'-Dichlorobenzidine	$2000 \mu g/mL$
10007	Polynuclear Aromatic Hydrocarbons	$2000 \mu g/mL$
100018	Phenols	2000 μg/mL
19207	Semi-volatile Spiking Mix	2000 μg/mL

- 7.2 Internal Standard: The internal standard mix is purchased from Supelco, catalog number 4-8902. This standard contains 2000 µg/mL of Acenapthene-d10, Chrysene-d12, 1,4-Dichlorobenzene-d4, Naphthalene-d8, Perylene-d12, and Phenanthrene-d10. If a SIM analysis, 5 µL of this mixture is added to the sample. If a SCAN analysis, 20 µL of this mixture is added to the sample.
- 7.3 GC/MS tuning standard: A methylene chloride solution containing 50 ng/µL decafluorotriphenylphosphine (DFTPP) is to be prepared. The standard should also contain 50 ng/µL of pentachlorophenol to verify injection port inertness and GC column performance. Store at 4°C or less when not being used. This standard expires 6 months from date of receipt.
- 7.4 Calibration Standards: Calibration standards are prepared by diluting the stock standards to final concentrations of 20 μ g/mL, 50 μ g/mL, 80 μ g/mL, 120 μ g/mL, and 160 μ g/mL. Expiration date for these standards is either date specified by Manufacturer or six months from date of receipt.
- 7.5 Surrogate Standards: Surrogate standards purchased from Supelco are listed below.

<u>Standard</u>	<u>Catalog Number</u>	Concentration
Acid Surrogate	4-8875	2000 μ g/mL
Base-Neutral	4-8925	$1000 \mu g/mL$

- 7.6 Matrix Spike Standards: The matrix spike standard is purchased from Absolute Standard, part number 19207. This standard contains 2000 $\mu g/mL$ of each compound. For a listing of the compounds consult the Absolute Standard catalog.
- 7.7 Methylene Chloride, pesticide grade or shown to be free of contaminants by GC.

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7.8 Methanol - High Purity from Baxter, Cat. #230-4 or equivalent.

8. PREVENTIVE MAINTENANCE

8.1 Daily remove 3 - 4" from injection side of column, replace septa. If retention gap is used remove 3" - 4" from injection end of retention gap not column.

9. TROUBLESHOOTING/CORRECTIVE ACTION

9.1 If Pentachlorophenol area is not acceptable or pentachlorophenol tails excessively, replace injection port liner and remove an additional 3 - 4 inches from the injector side of the column or retention gap.

10. QUALITY CONTROL

- 10.1 Before processing any samples, the analyst must demonstrate, through the analysis of a reagent water blank, that interferences from the analytical system, glassware, and reagents are under control. Each time a set of samples is extracted or there is a change in reagents, a reagent water blank must be processed as a safeguard against chronic laboratory contamination. The blank samples must be carried through all stages of the sample preparation and measurement steps.
- 10.2 The experience of the analyst performing GC/MS analyses is invaluable to the success of the methods. Each day that analysis is performed, the daily calibration standard should be evaluated to determine if the chromatographic system is operating properly.
- 10.3 Required instrument QC is found in the following sections:
 - 10.3.1 The GC/MS system must be tuned to meet the DFTPP specifications in Table I.
 - 10.3.2 There must be an initial calibration of the GC/MS system as specified in 11.2.2.
 - 10.3.3 The GC/MS system must meet the SPCC criteria specified in 11.3.3 and the CCC criteria in 11.3.4, each 12 hr.

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TABLE 2. QC ACCEPTANCE CRITERIAª

Parameter	Test conc. (µg/L)	Limit for s (µg/L)	Range for x (µg/L)	Range p, ps (%)
			 	· · · · · · · · · · · · · · · · · · ·
Acenaphthene	100	27.6	60.1-132.3	47-145
Acenaphthylene	100	40.2	53.5-126.0	33-145
Aldrin	100	39.0	7.2-152.2	D-166
Anthracene	100	32.0	43.4-118.0	27.133
Benzo(a) anthracene	100	27.6	41.8-133.0	33-143
Benzo(b) fluoranthene	100	38.8	42.0-140.4	24-159
Benzo(k)fluoranthene	100	32.3	25.2-145.7	11-162
Benzo(a) pyrene	100	39.0	31.7-148.0	17-163
Benzo(ghi) perylene	100	58.9	D-195.0	D-219
Benzyl butyl phthalate	100	23.4	D-139.9	D-152
B-BHC	100	31.5	41.5-130.6	24-149
Š-BHC	100	21.6	D-100.0	D-110
Bis(2-chloroethyl)ether	100	55.0	42.9-126.0	12-158
Bis(2-chloroethyl)mehtane	100	34.5	49.2-164.7	33-184
Bis(2-chloroisopropyl)ether	100	46.3	62.8-138.6	36-166
Bis(2-ethylhexyl)phthalate	100	41.1	28.9-136.8	8-158
4-Bromophenyl phenyl ether	100	23.0	64.9-114.4	53 - 127
2-Chloronaphthalene	100	13.0	64.5-113.5	60-118
4-Chlorophenyl phenyl ether	100	33.4	38.4-144.7	25-158
Chrysene	100	48.3	44.1-139.9	17-168
4,4'-DDD	100	31.0	D-134.5	D-145
4,4'-DDE	100	32.0	19.2-119.7	4-136
4,4"-DDT	100	61.6	D-170.6	Ď−203
Dibenzo(a,h)anthracene	100	70.0	D-199.7	D-227
Di-n-butyl phthalate	100	16.7	8.4-111.0	1-118
1,2-Dichlorobenzene	100	30.9	48.6-112.0	32-129
1,3-Dichlorobenzene	100	41.7	16.7-153.9	D-172
1,4-Dichlorobenzene	100	32.1	37.3-105.7	20-124
3,3'-Dichlorobenzidine	100	71.4	8.2-212.5	D-262
Dieldrin	100	30.7	44.3-119.3	29-136
Diethyl phthalate	100	26.5	D-100.0	D-114
Dimethyl phthatlate	100	23.2	D-100.0	D-112
2,4-Dinitrotoluene	100	21.8	47.5-126.9	39-139
2,6-Dinitrotoluene	100	29.6	68.1-136.7	50 - 158
Di-n-octylphthalate	100	31.4	18.6-131.8	4-146
Endosulfan sulfate	100	16.7	D-103.5	D-107
Endrin aldehyde	100	32.5	D-188.8	D-209
Fluoranthene	100	32.8	42.9-121.3	26-137
Fluorene	100	20.7	71.6-108.4	59-121
Heptachlor	100	37.2	D-172.2	D-192
Heptachlor epoxide	100	54.7	70.9-109.4	26.155
Hexachlorobenzene	100	24.9	7.8-141.5	D-152
Hexachlorobutadiene	100	26.3	37.8-102.2	24-116
Hexachloroethane	100	24.5	55.2-100.0	40-113
Indeno(1,2,3-cd)pyrene	100	44.6	D-150.9	D-171
* * *	100	63.3	46.6-180.2	21-196
Isophorone	100	30.1	35.6-119.6	21-133
Naphthalene	100	J V • I		

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TABLE 2. QC ACCEPTANCE CRITERIA - Continued

Parameter	Test conc. (µg/L)	Limit for s (µg/L)	Range for x (µg/L)	Range p, p _s (%)	
Nitrobenzene	100	39.3	54.3-157.6	35-180	
N-Nitrosodi-n-propylamine	100	55.4	13.6-197.9	D-230	
PCB-1260	100	54.2	19.3-121.0	D-164	
Phenanthrene	100	20.6	65.2-108.7	54-120	
Pyrene	100	25.2	69.6-100.0	52-115	
1,2,4-Trichlorobenzene	100	28.1	57.3-129.2	44-142	
4-Chloro-3-methylphenol	100	37.2	40.8-127.9	22-147	
2-Chlorophenol	100	28.7	36.2-120.4	23-134	
2,4-Chlorophenol	100	26.4	52.5-121.7	39-135	
2,4-Dimethylphenol	100	26.1	41.8-109.0	32-119	
2,4-Dinitrophenol	100	49.8	D-172.9	D-191	
2-Methyl-4,6-dinitrophenol	100	93.2	53.0-100.0	D-181	
2-Nitrophenol	100	35.2	45.0-166.7	29-182	
4-Nitrophenol	100	47.2	13.0-106.5	D-132	
Pentachlorphenol	100	48.9	38.1-151.8	14-176	
Phenol	100	22.6	16.6-100.0	5-112	
2,4,6-Trichlorophenol	100	31.7	52.4-129.2	37-144	

s = Standard deviation of four recovery measurements, in μ g/L.

 $x = Average recovery for four recovery measurements, in <math>\mu g/L$.

p, ps = Percent recovery measured.

D = Detected; result must be greater than zero.

^aCriteria from 40 CFR Part 136 for Method 625. These criteria area based directly on the method performance data in Table 7. Where necessary, the limited for recovery have been broadened to assure applicability of the limits to concentrations below those used to develop Table 7.

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10.5 With each batch of samples extracted or diluted analyze a reagent blank, a matrix spike, a matrix spike duplicate/duplicate for each analytical batch (up to a maximum of 20 samples/batch) to assess accuracy.

- 10.5.1 The concentration of the spike in the sample should be determined as follows:
 - If 250 mL of sample is extracted, add 1 mL of 10.5.1.1 matrix spike.
 - If 20 mL or less of sample is used, add 0.2 mL of 10.5.1.2 matrix spike.
 - 10.5.1.3 % RPD for MSD and MS must be less than 40%.
- 10.6 If any analyte fails the acceptance criteria for recovery, a QC check standard containing each analyte that failed must be prepared and analyzed.
 - Prepare the QC check standard by adding 1.0 mL of the QC 10.6.1 check sample concentrate to 1 L of reagent water. The QC check standard needs only to contain percent recovery (ps) as 100 (A/T)%, where T is the true value of the standard concentration and A is the value obtained.
 - Compare the percent recovery (ps) for each analyte with the 10.6.2 corresponding QC acceptance criteria found in Table 2. Only analytes that failed the test need to be compared with these criteria. If the recovery of any such analyte falls outside the designated range, the laboratory performance for that analyte is judged to be out of control, and the problem must be immediately identified and corrected. The analytical result for the analyte in the unspiked sample is suspect and may not be reported for regulatory compliance purposes.

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- 10.7 As part of the QC program, method accuracy for each matrix studied has been assessed and records must be maintained.
- 10.8 To determine acceptable accuracy and precision limits for surrogate standards the following procedure should be performed.

Spike concentration limits are given below:

Compound	Re	<u>€</u> C(overy
2-Methylphenol	27	_	120%
4-Methylphenol	27	-	120
2,4-Dinitrotoluene	24	-	96
Hexachlorobenzene	20	-	120
Hexachlorobutadiene	20	-	120
Hexachloroethane	20	-	120
Nitrobenzene	76	~	127
Pentachlorophenol	9	-	103
Pyridine	20	-	120
2,4,5-Trichlorophenol	20	-	120
2,4,6-Trichlorophenol	20	-	120
1,4-Dichlorobenzene	20	-	120

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TABLE 3. METHOD ACCURACY AND PRECISION AS FUNCTIONS OF CONCENTRATIONS

Parameter	Accuracy, as recovery, x1 (µg/L)	Single analyst precision, sr1 (µg/L)	
Acenaphthene	0.96C+0.19	0.15x-0.12	0.21x-0.67
Acenaphthylene	0.89C+0.74	0.24x-1.06	0.26x-0.54.
Aldrin	0.78C+1.66	0.27x-1.28	0.43x+1.13
Anthracene	0.80C+0.68	021.x-0.32	0.27x-0.64
Benzo(a) anthracene	0.88C-0.60	0.15x+0.93	0.26x-0.21
Chloroethane	0.99C-1.53	0.14x-0.13	0.17x-0.28
Benzo(b)fluoranthene	0.93C-1.80	0.22x+0.43	0.29x+0.96
Benzo(k)fluoranthene	0.87C-1.56	0.19x+1.03	0.35x+0.40
Benzo(a)pyrene	0.90C-0.13	0.22x+0.48	0.32x+1.35
Benzo(ghi)perylene	098C-0.86	0.29x+2.40	0.51x-0.44
Benzyl butyl phthalate	0.66C-1.68	0.18x+0.94	0.53x + 0.92
B-BHC	0.87C-0.94	0.20x-0.58	0.30x+1.94
Š-BHC	0.29C-1.09	0.34x+0.86	0.93x-0.17
Bis(2-chloroethyl)ether	0.86C-1.54	0.35x099	0.35x+0.10
Bis(2-chloroethoxy) methane	1.12C-5.04	0.16x-1.34	0.26x+2.01
Bis(2-chloroisopropyl)ether	1.03C-2.31	0.24x + 0.28	0.25x+1.04
Bis(2-ethylhexyl)phthalate	0.84C-1.18	0.26x+0.73	0.36x+0.67
4-Bromophenyl phenyl ether	0.91C-1.34	0.13x+0.66	0.16x+0.66
2-Chloronaphthalene	0.89C+0.01	0.07x + 0.52	0.13x+0.34
4-Chlorophenyl phenyl ether	0.91C+0.53	0.20x-0.94	0.30x - 0.46
Chrysene	0.93C-1.00	0.28x+0.13	0.33x-0.09
4,4'-DDD	0.56C-0.40	0.29x-0.32	0.66x-0.96
4,4'-DDE	0.70C-0.54	0.26x-1.17	0.39x-1.04
4,4'-DDT	0.79C-3.28	0.42x+0.19	0.65x-0.58
Dibenzo(a,h)anthracene	0.88C+4.72	0.30x+8.51	0.59x+0.25
Di-n-butyl phthalate	0.59C+0.71	0.13x+1.16	0.39x+0.60
1,2-Dichlorobenzene	0.80C+0.28	0.20x+0.47	0.24x+0.39
1,3-Dichlorobenzene	0.86C-0.70	0.25x+0.68	0.41x + 0.11
3,3'-Dichlorbenzidine	1.23C-12.65	0.28x+7.33	0.47+3.45
Dieldrin	0.82C-0.16	0.20x-0.16	0.26x-0.07
Diethyl phthalate	0.43C+1.00	0.28x+1.44	0.52x+0.22
Dimethyl phthalate	0.20C+10.3	0.54x+0.19	1.05x-0.92
2,4-Dinitrotoluene	0.92C-4.81	0.12x+1.06	0.21x+1.50
2,6-Dinitrotoluene	1.06C-3.60	0.14x+1.26	0.19x+0.35
Di-n-octylphthalate	0.76C-0.79	0.21x+1.19	0.37x+1.19
Endosulfan sulfate	0.39C-0.41	0.12x+2.47	0.63x-1.03
Endrin aldehyde	0.76C-3.86	0.18x+3.91	0.73x - 0.62
Fluoranthene	0.81C+1.10	0.22x-0.73	0.28x-0.60
Fluorene	0.90C-0.00	0.12x+0.26	0.13x+0.61
Heptachlor	0.87C-2.97	0.24x-0.56	0.50x-0.23
Jeptachlor epoxide	0.92C-1.87	0.33x-0.46	0.28x+0.64
Hexachlorobenzene	0.74C+0.66	0.18x-0.10	0.43x - 0.52
Hexachlorobutadiene	0.71C-1.01	0.19x+0.92	0.26x+0.49
	0.73C-0.83	0.17x+0.67	0.17x+0.80
Hexachloroethane	0.730 0.03	3.4.22.000.	

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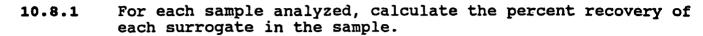
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TABLE 3. METHOD ACCURACY AND PRECISION AS FUNCTIONS OF CONCENTRATIONS - Continued

Parameter	Accuracy, as recovery, x1 (µg/L)	Single analyst precision, sr1 (µg/L)	
Indeno(1,2,3-cd)pyrene	0.78C-3.10	0.29x+1.46	0.50x-0.44
Isophorone	1.12C+1.41	0.27x+0.77	0.33x+0.26
Naphthalene	0.76C+1.58	0.21x-0.41	0.30x-0.68
Nitrobenzene	1.09C-3.05	0.19x+0.92	0.27x+0.21
N-Nitrosodi-n-propylamine	1.12C-6.22	0.27x+0.68	0.44x+0.47
PCB-1260	0.81C-10.86	0.35x+3.61	0.43x + 1.82
Phenanthrene	0.87C+0.06	0.12x+0.57	0.15x+0.25
Pyrene	0.84C-0.16	0.16x+0.06	0.15x+0.31
1,2,4-Trichlorobenzene	0.94C-0.79	0.15x+0.85	0.21x + 0.39
4-Chloro-3-methylphenol	0.840.35	0.23x+0.75	0.29x+1.31
2-Chlorophenol	0.78C+0.29	0.18x+1.46	0.28x+0.97
1,2,4-Trichlorobenzene	0.94C-0.79	0.15x+0.85	0.21x+0.39
4-Chloro-3-methylphenol	0.84C+0.35	0.23x+0.75	0.29x+1.31
2-Chlorophenol	0.78C+0.29	0.18x+1.46	0.28x+0.97
2,4-Dichlorophenol	0.87C-0.13	0.15x+1.25	0.21x+1.28
2,4-Dimethylphenol	0.71C+4.41	0.16x+1.21	0.22x+1.31
2,4-Dinitrophenol	0.81C-18.04	0.38x+2.36	0.42x+26.29
2-Mthyl-4,6-dinitrophenol	1.04C-28.04	0.10x+42.29	0.26x+23.10
2-Nitrophenol	0.07C-1.15	0.16x+1.94	0.27x + 2.60
4-Nitrophenol	0.61C-1.22	0.38x+2.57	0.44x+3.24
Pentachlorophenol	0.93C+1.99	0.24x + 3.03	0.30x+4.33
Phenol	0.43C+1.26	0.26x+0.73	0.35x+0.58
2,4,6-Trichlorphenol	0.91C-0.18	0.16x+2.22	0.22x+1.81

- x1 = Expected recovery for one or more measurements of a sample containing a concentration of C, in μ g/L.
- $sr1 = Expected single analyst standard deviation of measurements at an average concentration of x, in <math>\mu g/L$.
 - S1 = Expected interlaboratory standard deviation of measurements at an average concentration found of x, in μ g/L.
 - $C = True value for the concentration, in <math>\mu g/L$.
 - x = Average recovery found for measurements of samples containing a concentration of C, in μ g/L.



- Once a minimum of thirty samples of the same matrix have been analyzed, calculate the average percent recovery (P) and standard deviation of the percent recovery (s) for each of the surrogates.
- 10.8.3 For a given matrix, calculate the upper and lower control limit for method performance for each surrogate standard. This should be done as follows:

Upper Control Limit (UCL) = p + 2s Lower Control Limit (LCL) = p - 2s

10.8.4 If recovery is not within limits, the following procedures are required.

Reextract and reanalyze the sample or flag the data as "estimated concentration". If recovery is still a problem label as "matrix effect".

10.8.5 At a minimum, the laboratory should update surrogate recovery limits on a matrix-by-matrix basis, annually.

11. PROCEDURE

- 11.1 Sample preparation: Samples are prepared by EPA Method 3510 and diluted prior to analysis.
- 11.2 Initial calibration: The GC/MS operating conditions:

Mass range: 35-500 amu Scan time: 1 sec/scan

Initial column temperature and hold time: 40°C Column temperature program: 40-290°C at 8°C/min Final column temperature hold: 290°C for 4 min.

Injector temperature: 250-300°C

Transfer line temperature: 250-300°C

Source temperature: According to manufacturer's specifications

Injector: splitless Sample volume: 1 μ L

Carrier gas: Helium at 30 cm/sec.

11.2.1 Each GC/MS system must be hardware-tuned to meet the EPA criteria for a 50-ng injection of DFTPP. Pentachlorophenol should be present at its normal response, and no peak tailing should be visible. If degradation is excessive and/or tailing is noted, the injection port may require cleaning.

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Analyze 1 μL of each calibration standard (containing internal standards) and tabulate the area of the primary characteristic ion against concentration for each compound (as indicated in Table 1). Figure 1 shows a chromatogram of a calibration standard containing base/neutral and acid analytes. Calculate response factors (RFs) for each compound as follows:

 $RF = (A_xC_{is})/(A_{is}C_x)$

where:

 A_x = Area of the characteristic ion for the compound being measured.

 A_{is} = Area of the characteristic ion for the specific internal standard.

 C_x = Concentration of the compound being measured (ng/ μ L).

 $C_{is} = Concentration$ of the specific internal standard (ng/ μL).

The average RF should be calculated for each compound. The percent relative standard deviation (%RSD = 100[SD/RF] should also be calculated for each compound. However, the %RSD for each individual Calibration Check Compound (CCC) (see Table 2) must be less than 30%. The relative retention times of each compound in each calibration run should agree within 0.06 relative retention time units.

TABLE 5. CALIBRATION CHECK COMPOUNDS

Base/Neutral Fraction	Acid Fraction
Acenaphthene 1,4-Dichlorobenzene Hexachlorobutadiene N-Nitroso-di-n-phenylamine Di-n-octylphthalate Fluoranthene Benzo(a)pyrene	4-Chloro-3-methylphenol 2,4-Dichlorophenol 2-Nitrophenol Phenol Pentachlorphenol 2,4,6-Trichlorophenol

11.3 Daily GC/MS calibration:

11.3.1 Prior to analysis of samples, the GC/MS tuning standard must by analyzed. A 50-ng injection of DFTPP must result in a mass spectrum for DFTPP which meets the criteria given in Table 1. These criteria must be demonstrated during each 12-hr shift.

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11.3.2 A calibration standard(s) at mid-level concentration containing all semivolatile analytes, including all required surrogates, must be performed every 12-hr during analysis. Compare the response factor data from the standards every 12-hr with the average response factor from the initial calibration for a specific instrument as per the SPCC and CCC criteria.

- 11.3.3 System Performance Check Compounds (SPCCs): A system performance check must be made during every 12 hr shift.
 - 11.3.3.1 Minimum acceptable average RF is 0.050 for all SPCCs.
 - 11.3.3.2 SPCCs are N-nitroso-di-n-propylamine, hexachlorocyclopentadiene, 2,4-Dinitrophenol, 4-nitrophenol.
- 11.3.4 Calibration Check Compounds (CCCs): After the system performance check is met, all TCLP compounds are used as CCCs to check the validity of the initial calibration. Calculate the percent difference using:

% Difference =
$$\frac{\overline{RF} - RF}{\underline{I} \underline{C} \times 100}$$

$$\overline{RF}$$
I

where:

 \overline{RF}_{I} = average response factor from initial calibration.

RF_c - response factor from current verification check standard.

If the percent difference for any compound is greater than 20, the laboratory should consider this a warning limit. If the percent difference for each CCC is less than 30%, the initial calibration is assumed to be valid. If the criterion is not met (>30% difference) for any one CCC, corrective action MUST be taken. Problems similar to those listed under SPCCs could affect this criterion. If no source of the problem can be determined after corrective action has been taken, a new five-point calibration MUST be generated. This criterion MUST be met before sample analysis begins.

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11.3.5 The internal standard responses and retention times in the calibration check standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 sec from the last check calibration (12 hr), the chromatographic system must be inspected for malfunctions and corrections must be made, as required. If the EICP area for any of the internal standards changes by a factor of two (-50% to +100%) from the last daily calibration standard check, the GC/MS system and standards must be inspected for malfunctions and corrections must be made, as appropriate.

11.4 GC/MS analysis:

- 11.4.1 Spike the 1-mL extract obtained from sample preparation with 20 μ L of the internal standard solution just prior to analysis.
- Analyze the 1-mL extract by GC/MS using a 30-m x 0.25-mm (or 0.32-mm) silicone-coated fused-silica capillary column. The mandatory GC/MS operating conditions to be used are specified in Paragraph 7.3.
- 11.4.3 If the response for any quantitation ion exceeds the initial calibration curve range of the GC/MS system, extract dilution must take place. Additional internal standard must be added to the diluted extract to maintain the required 40 ng/ μ L of each internal standard in the extracted volume. The diluted extract must be reanalyzed.
- 11.4.4 Perform all qualitative and quantitative measurements as described in Paragraph 7.6. Store the extracts at 4°C, protected from light in capped vials equipped with unpierced Teflon-lined septa.

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11.5 Data interpretation:

11.5.1 Qualitative analysis:

11.5.1.1 An analyte is identified by comparison of the sample mass spectrum with the mass spectrum of a standard of the suspected compound (standard reference spectrum). Mass spectra for standard reference should be obtained on the user's GC/MS within the same 12 hours as the sample analysis. These standard reference spectra may be obtained through analysis of the calibration standards. Two criteria must be satisfied to verify identification: (1) elution of sample component at the same GC relative retention time (RRT) as the standard component; and (2) correspondence of the sample component and the standard component mass spectrum.

The sample component RRT must compare within ±0.06 RRT units of the RRT of the standard component. For reference, the standard must be run within the same 12 hrs as the sample. If coelution of interfering components prohibits accurate assignment of the sample component RRT from the total ion chromatogram, the RRT should be

current profiles for ions unique to the component of interest.

assigned by using extracted ion

The relative intensities of ions must agree within plus or minus 20% between the standard and sample spectra. (Example: For an ion with an abundance of 50% in the standard spectra, the corresponding sample abundance must be between 30 and 70 percent.

11.5.1.2 For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification.

Guidelines for making tentative identification are:

(1) Relative intensities of major ions in the reference spectrum (ions >10% of the most abundant ion) should be present in the sample spectrum.

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SUPERSEDES:

(2) The relative intensities of the major ions should agree within 0+20%. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must be between 30 and 70%).

- Molecular ions present in the reference spectrum should be present in (3) the sample spectrum.
- Ions present in the sample spectrum but not in the reference spectrum (4)should be reviewed for possible background contamination or presence of coeluting compounds.
- Ions present in the reference spectrum but not in the sample spectrum (5) should be reviewed for possible subtraction from the sample spectrum because of background contamination or coeluting peaks. Data system library reduction programs can sometimes create these discrepancies.

11.5.2 Quantitative analysis:

- 11.5.2.1 When a compound has been identified, the quantitation of that compound will be based on the integrated abundance from the EICP of the primary characteristic ion. Quantitation will take place using the internal standard technique. internal standard used shall be the one nearest the retention time of that of a given analyte.
- 11.5.2.2 Calculate the concentration of each identified analyte in the sample as follows:

Water:

concentration
$$(\mu g/L) = \frac{(A_x)(I_s)(V_t)}{(A_{is})(RF)(V_o)(V_i)}$$

where:

 $A_x = Area of characteristic ion for compound$ being measured.

 $I_s = Amount of internal standard injected (ng).$

 V_t = Volume of total extract, taking into account dilutions (i.e., a 1-to-10 dilution of a 1-mL extract will mean $V_t = 10,000 \mu L$. If half the base/neutral extract and half the acid extract are combined, Vt = 2,000.

 A_{is} = Area of characteristic ion for the internal standard.

RF = Response factor for compound beig measured (Paragraph 7.3.3).

 $V_o = Volume of water extracted (mL).$

 $V_i = Volume of extract injected (\mu L)$.

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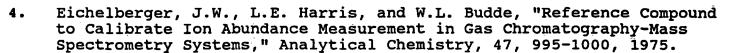
- 11.5.2.3 Report results without correction for recovery data.
- 11.5.2.4 Quantitation of multicomponent compounds (e.g., Aroclors) is beyond the scope of Method 8270.

12. CALCULATION

12.1 See Section 11.5.2.2.

13. REFERENCES

- U.S. EPA 40 CFR Part 136, "Guidelines Establishing Test Procedures for 1. the Analysis of Pollutants Under the clean Water Act, Method 625," October 26, 1984.
- U.S. EPA Contract Laboratory Program, Statement of Work for Organic 2. Analysis, July 1985, Revision.
- Provost, L.P. and R.S. Elder, "Interpretation of Percent Recovery 3. Data," American Laboratory, 15, 58-63, 1983.



- 5. "Method Detection Limit for Methods 624 and 625," Olynyk, P., W.L. Budde, and J.W. Eichelberger, Unpublished report, October 1980.
- "Interlaboratory Method Study for EPA Method 625-Base/Neutrals, Acids, 6. and Pesticides, " Final Report for EPA Contract 68-03-3102 (in preparation).
- Burke, J.A. "Gas Chromatography for Pesticide Residue Analysis; Some 7. Practical Aspects," Journal of the Association of Official Analytical Chemists, 48, 1037, 1965.
- Reference EPA Method 8270. 8.

APPENDIX VII-C-5
ANALYST TRAINING PROTOCOL

Method #: 7201 Rev: 2/93 Safety-Kleen Corp. Supersedes: 1/91 ATTACHED IS A DOCUMENT FOR: REVISION DATE: 2/17/93 TITLE: TRAINING PROCEDURE FOR LABORATORY METHODOLOGY AND DOCUMENTATION OF TRAINING SERIES/SUBJECT 7000 Qualification and Training Personnel Training 7200 APPROVALS/CONCURRENCES: DEPARTMENT MANAGER(8) VICE PRESIDENT, TECHNICAL

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TITLE: TRAINING PROCEDURE FOR LABORATORY METHODOLOGY AND DOCUMENTATION OF TRAINING

1. SUBJECT

1.1 This Standard Operating Procedure (SOP) outlines how training of laboratory methodology is performed and how to document this training.

2. PURPOSE

- 2.1 The purpose of this SOP is to standardize training of laboratory personnel on methodology and provide a means of documenting this training.
- 2.2 The purpose of documented training is to establish that an analyst is capable of meeting the precision and accuracy acceptance criteria of a given method.

3. SCOPE

3.1 This SOP is applicable to all Safety-Kleen laboratory employees conducting or receiving training on any analytical methodology. It is applicable to both initial training and retraining/recertification situations as well as partial training.

4. RESPONSIBILITIES

- 4.1 LAB MANAGER Ensure that employees are being trained properly and timely, and that training documentation is complete and correct. Determine whether the employee is sufficiently trained to perform the method correctly and independently. Certify trainees who have successfully completed either initial training or retraining.
- 4.2 TRAINER Train the trainee on all aspects of the method theoretical, procedural, mathematical calculations, etc. Demonstrate the method to the trainee. Document training by completing one of the following forms: Analyst Training Form, Analyst Retraining Form, Analyst Partial Training Form, or the Analyst Partial Retraining Form (Attachment 1).

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4.3 TRAINEE - Ensure that method is understood and that (s)he is able to perform method independently. Ensure that training documentation is complete.

5. DEFINITIONS

- 5.1 TRAINER Individual experienced in, and currently certified on, the method to be taught, who provides training to trainee. While it is the intent that trainers be experienced with the method, it is also recognized that under certain circumstances, such as when a new method is promulgated, no individual in the laboratory will be experienced or certified on the new method. Under such circumstances, it is permissible for two non-certified analysts to train each other, each fulfilling the role of trainer to the other. Technical assistance is available from the Tech Center to ensure proper implementation and execution of the new SOP.
- 5.2 TRAINEE Individual who will receive training. The trainee may be inexperienced on a method as in an initial training situation or experienced as in a recertification situation.
- 1aboratory or a laboratory section (i.e. a group leader). This person is assumed to be perpetually trained and does not require training documentation unless (s)he is regularly performing sample analyses. "Regularly" performing sample analysis is defined as analyzing more than two samples per period which does not include any samples analyzed while fulfilling the role of trainer during training situations. In the case where the laboratory manager is regularly performing sample analyses, a complete training file must be maintained and his/her training may be:
 - A) performed simultaneously with another analyst, i.e. the manager trains the analyst and the analyst trains the manager; or,
 - B) performed by a Quality Assurance specialist, e.g. a QA Coordinator or the Training Chemist.
- 5.4 INITIAL TRAINING A training event in which the trainee has not been previously trained on the analytical method.

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5.5 ANNUAL RETRAINING (RECERTIFICATION) - A training event in which the trainee has been previously trained on the method. Recertification of all analysts is required annually on all methods the analyst is required to perform.

event in which the trainee is trained on only a specific subset of the sections of an SOP. Certain situations exist where it is desirable to train and certify an analyst on only a portion of an analytical method (e.g. on the preparation portion only of the PCB method, 9202, and not on the analytical sections). In recognition of this need, a provision has been made for partial training of analysts who will be performing only a portion of an SOP. The procedure for partial training is identical to that for an initial or retraining event except that only the appropriate section(s) of a method are taught, learned, performed, and documented on the Analyst Partial (Re)Training Form.

6. PROCEDURE

6.1. INITIAL TRAINING

- 6.1.1 The lab manager or designee assigns a trainer who is experienced in the method which is going to be taught and who is currently certified in that method, to train the trainee.
- 6.1.2 Using a written SOP, the trainer explains each section of the method to the trainee such that both are confident that the details of the method are understood by the trainee.
- 6.1.3 The trainer and the trainee document this understanding in Section 1 of the Analyst Training Form (Attachment 1). Both should initial each section in the spaces provided on the form. If a section does not exist in the method, write "N/A" in the initials space.
- 6.1.4 The trainer demonstrates the method to the trainee by analyzing appropriate training samples and generating at least three sets of valid non-zero analytical data. Appropriate training samples include initial multipoint calibrations, CCSs, duplicate "non-zero" samples (samples which contain detectable quantities of analyte), matrix

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spiked samples, matrix spike duplicates, etc., with the condition that such are specifically called for in the SOP. Special certification samples provided by the Tech Center which contain known quantities of analyte(s) are also acceptable as training samples. All analytical data generated during the demonstration of the method must meet the acceptance criteria as set forth in the QC section of the SOP to be acceptable for training. This demonstration of the method by the trainer to the trainee shall be documented in Section 2 of the Analyst Training Form. The analytical data generated shall be attached to the form and the results recorded in Section 3.

- 6.1.5 The trainee then performs the method by repeating the same three sets of analyses performed by the trainer and under the observation of the trainer. The results must be within the method control limits as specified in the SOP to be acceptable for analyst certification. The analytical results generated by the trainee shall also be recorded in section 3 and attached to the Analyst Training Form.
- 6.1.6 The Analysts Training Form is forwarded to the laboratory manager or his/her designee for evaluation. Depending on the results of the evaluation, the laboratory manager or designee either certifies the trainee, establishing that the trainee is capable of performing the method correctly and independently, or schedules additional training to achieve analyst certification.
- 6.1.7 The results of any additional training shall also be attached to the Analysts Training Form.
- 6.1.8 Steps 6.1.6 and 6.1.7 are repeated until the trainee achieves certification on the method. This initial training certification is valid for one year unless a new revision of the method is promulgated before the end of that one year period.

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6.2 ANNUAL RETRAINING

6.2.1 Annual retraining/recertification is performed in situations where the analyst has previously been trained on the method, i.e. has had an initial training. Recertification of all analysts is required annually on all methods the analyst is required to perform.

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- 6.2.2 The lab manager or designee assigns a trainer who is currently certified to perform the method to train the trainee.
- 6.2.3 The trainee reviews each section of the method and documents this review in Section 1 of the Analyst Retraining Form (Attachment 1).
- 6.2.4 For recertification, the QC data which is being generated on a daily basis can be used to document that the analyst can meet the precision and accuracy requirements as set forth in the method. The trainer shall observe the trainee performing one of the required QC analyses and the results shall be documented in Section 2 of the Analyst Retraining Form.
- 6.2.5 The results generated from the analysis of two other unobserved sets of QC data performed by the trainee shall be recorded in Section 3 of the Analyst Retraining Form.
- 6.2.6 The Analyst Retraining Form is forwarded to the laboratory manager or his/her designee for evaluation. Depending on the results of the evaluation, the laboratory manager or designee either certifies the trainee, establishing that the trainee is capable of continuing to perform the method independently and correctly, or schedules additional training to achieve analyst recertification.
- 6.2.7 The results of any additional training shall be attached to the Analyst Retraining Form.
- 6.2.8 Steps 6.2.6 and 6.2.7 are repeated until the trainee has been recertified on the method. This retraining certification is valid for one year unless a new revision of the method is promulgated before the end of that one year period.

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6.3. INITIAL PARTIAL TRAINING

The laboratory manager or designee assigns a 6.3.1 trainer who is currently fully certified (as 6356 opposed to partially certified) in the method to train the trainee.

- Using a written SOP, the trainer explains the 6.3.2 appropriate sections of the SOP to the trainee such that both are confident that the trainee OFW THE ST understands the details of those portions of the method which (s)he will be required to perform. It is mandatory to cover The Scope & Application and Safety & Waste Handling sections of the SOP as 1975 B 28913. well as any pertinent deviations.
- The trainer and trainee document this 6.3.3 understanding by completing Section 1 of the Analyst Partial Training Form (Attachment 1) by 2.1837 3. listing each section of the SOP that was covered. Both trainer and trainee should initial each 3.3.5 section covered in the spaces provided on the F....... form.
 - The trainer demonstrates the method to the trainee 6.3.4 by preparing and analyzing three sets of non-zero analytical data and (where applicable) a method blank. To use the previous example, where the analyst is being trained on only the prep portion # 11 D of SOP 9202, the preparation of a method blank, a positive (non-zero) "production" sample, a matrix spike, and a matrix spike duplicate would be appropriate. All analytical data generated during appropriate. All analytical data generated do the demonstration of the method must meet the acceptance criteria as set forth in the QC section death of the SOP to be acceptable for training. This demonstration of the method by the trainer to the trainee shall be documented in Section 2 of the Analyst Partial Training Form. The analytical data generated shall be attached to the form and the results recorded in Section 3.

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the trainee then performs the method by repeating the same three preparations and/or analyses demonstrated by the trainer and under the observation of the trainer. In the case where the analyst is being trained on preparation procedures only, these samples will be analyzed by the trainer (who, as was noted above, is fully certified in all sections of the method). The analytical results generated by the trainee must be within the method control limits as specified in the QC section of the SOP to be acceptable for analyst partial certification. The results generated by the analysis of the samples prepared by the trainee shall also be recorded in Section 3 and attached to the Analyst Partial Training Form.

- 6.3.6 The Analyst Training Form is forwarded to the laboratory manager or his/her designee for evaluation. Depending on the results of the evaluation, the laboratory manager or designee either certifies the trainee, establishing that the trainee is capable of performing those sections of the method independently and correctly, or schedules additional training to achieve analyst certification.
 - 6.3.7 The results of any additional training shall also be attached to the Analyst Training Form.
- 6.3.8 Steps 6.3.6 and 6.3.7 are repeated until analyst partial certification is achieved. This initial partial certification is valid for one year unless a new version of the method is promulgated before the end of that one year period.

6.4 ANNUAL PARTIAL RETRAINING

- 6.4.1 Annual partial retraining/recertification is performed in situations where the analyst has previously been partially trained on the method, i.e. has had an initial partial training. Partial (or full) recertification of all analysts is required annually on all methods the analyst is required to perform.
- 6.4.2 The lab manager or designee assigns a trainer who is currently fully certified (as opposed to partially certified) to perform the method to train the trainee.

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State of the State 6.4.3 The trainee reviews each section of the SOP pertinent to his/her partial certification and documents this review in section 1 of the Analyst

Partial Retraining Form (attachment 1).

empleades and a compact Armadus males of a 6.4.4 For recertification, the QC data which is being generated (partially) by the analyst on a daily basis can be used to document that the analyst can meet the precision and accuracy requirements as set forth in the method. The trainer shall observe the trainee partially performing one of the required QC analyses and the results shall be documented in section 2 of the Analyst Partial Retraining Forms of Fords A El motornace ing the state of t

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- The Analyst Partial Retraining Form is forwarded to the laboratory manager or designee for evaluation. Depending on the results of the $\mathbb{C}^{\mathcal{A}}$ evaluation, the laboratory manager or designee either certifies the trainee establishing that the trainee is capable of continuing to partially perform the method independently and correctly, or schedules additional training to achieve analyst partial recertification. They can be for the property of the be-
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- Steps 6.4.6 and 6.4.7 are repeated until the 6.4.8 trainee has been partially recertified on the method. This partial retraining certification is valid for one year unless a new revision of the method is promulgated before the end of that one year period. The second of the

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ANALYST TRAINING FORM

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ANALYST PARTIAL TRAINING FORM

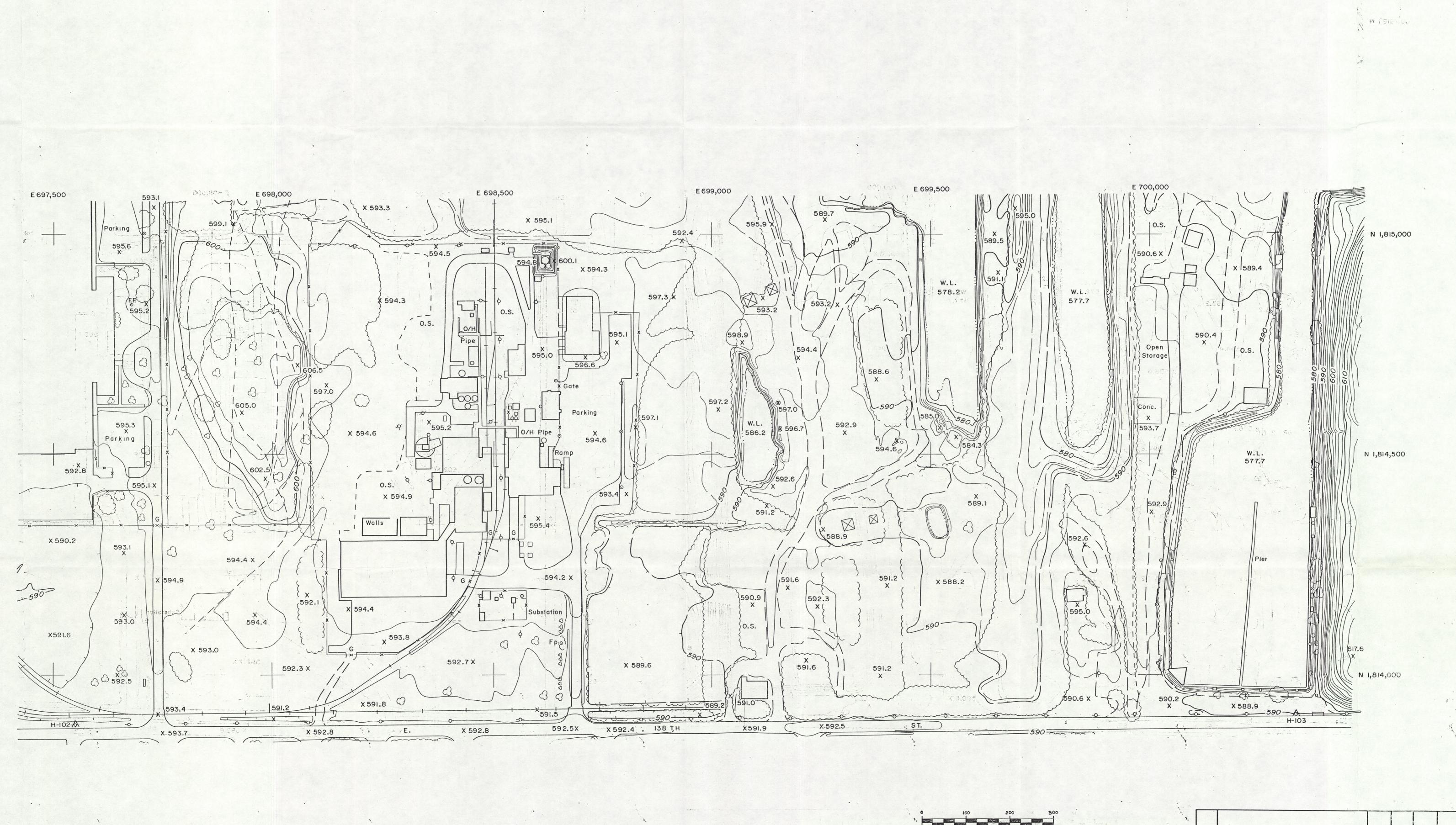
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ANALYST PARTIAL RETRAINING FORM

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